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To the SCHOOL-MASTERS *of* GREAT BRITAIN *and* IRELAND, *and to other* TEACHERS *of* YOUTH *in* ARITHMETIC.

GENTLEMEN,

AS there are ſeveral Books of this Sort already publiſhed by ſeveral good Hands, YOU may be ſurprized that I ſhould attempt any Thing farther on the Subject of *Arithmetic*, and perhaps may charge me with a great deal of Vanity: But I hope YOU will not be too ſevere upon me till YOU firſt hear the Reaſons that I have given in the Preface, and in the Obſervations on *Book-keeping*; and then I make no doubt but moſt of YOU will approve of the Plan, and I ſhall at the ſame Time be clear'd from a raſh Cenſure which may be paſſed upon me undeſervedly for the Want of a candid Peruſal.

If YOU will favour me thus far, YOU will ſoon ſee that my Deſign is to make every Thing more eaſy and uſeful; and therefore I beg your Encouragement and kind Aſſiſtance in helping me to promote the Education of Youth in the ſeveral Branches of Learning, which YOU are

very ſenſible is ſtill very much wanted, and cannot too early nor too earneſtly be impreſſed upon, and inculcated into the Minds of OUR Pupils.

After having returned YOU hearty Thanks for YOUR kind Encouragement of my former Works, and intreating YOU not only to pardon thoſe Errors which YOU may occaſionally meet with; but to correct them and give me early Notice of the ſame, I beg leave with all due Reſpect, to ſubſcribe myſelf,

Gentlemen,

Your obliged humble Servant,

D. FENNING.

Royal Exchange Aſſurance Office,
London, July 15, 1765.

PREFACE.

PREFACE

KIND READER,

I Hear preſent YOU with another ſmall Labour of mine, and notwithſtanding there are many Books of this Sort, yet there is ſufficient Room left for YOUR farther Improvement.

I mean not in the leaſt to depreciate, or leſſen the Works of any other Perſon upon this Subject by praiſing my own Performance; but if I have omitted ſome Things that are not at all neceſſary for young Beginners, and ſubſtituted more material inſtead thereof; I think I ſhall be entitled to YOUR Commendations.

This I have endeavoured to do; and my Eye has been conſtantly upon that Plan, which I thought would be of moſt Service to YOU; and therefore

1ſt. I have omitted all thoſe intricate and unneceſſary Calculations that I thought improper in ſuch a ſmall Treatiſe; and ſeveral of my good Friends and eminent School-maſters have commended me for it, and have acknowledged that many much more uſeful Things might have been inſerted in ſeveral Books of this Sort than has hitherto been.

2. I have therefore firſt treated of all the common Rules in vulgar and decimal Arithmetic in as familiar a Manner as I can, leading the young TYRO on Step by Step, in order to make the

Practice of Arithmetic delightful and not burthenſome.

3. Then in Part II. inſtead of giving Algebraic Theorems, and rendering the Work tireſome by intricate Calculations on Reverſions Annuities, &c. I have given plain and eaſy Directions for common Book-keeping; a Branch of Learning, tho' ſo abſolutely neceſſary in all Stations of Life, has been totally neglected, And

4. To render the Work ſtill more diverting as well as uſeful, I have added an Appendix to my firſt Deſign; in which I have treated of Croſs Multiplication, giving ſome ſhort and eaſy Inſtructions in Menſuration; ſhewing the Learner not only how to work the Rule of Croſs Multiplication; but to meaſure Boards, Timber and Brickwork, as alſo ſome ſhort Examples in Gauging wrought both by the Pen and Sliding Rule. Theſe certainly muſt be of more Uſe than ſuch Things, which not one Man to a Thouſand ever had, or ever may have Occaſion for.

Laſtly, As the Failings of Mankind are too familiar with him, for himſelf truly to diſcern them; therefore I hope you will forgive thoſe Errors that have eſcaped my Notice; but I have endeavoured to correct the more material Ones in the latter Part of the Work to which I refer YOU; and after having wiſhed YOU good Succeſs in all your Undertakings, I ſincerely ſubſcribe myſelf,

KIND READER,

Your well Wiſher,

D. FENNING.

RECOMMENDERS.

We whoſe Names are hereunto ſubſcribed, beg leave to recommend this little Treatiſe as the moſt uſeful of the Sort extant, the Rules being very plain and eaſy, and well adapted to Life and Buſineſs, it certainly will be a great Help to the Scholar and a good Aſſiſtant to the Tutor.

The Rev. Mr. Bernard,
The Rev. Mr. Chalmers.
The Rev. Dr. Cokayne, *A. P. G.*
The Rev. Mr. Duncome,
The Rev. Mr. Fiſke,
The Rev. Mr. Fontaine,
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The Rev. Mr. Pearce,
The Rev. Mr. Ryland,
The Rev. Mr. Turner,
The Rev. Dr. Watſon.

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To Mr. Fenning *on his* Schoolmaſter's Companion.

SIR,

PUrſuant to your Requeſt I have peruſed this little Treatiſe for the uſe of Schools, and think it juſtly deſerves the Name of the *Scholar's beſt Inſtructor*: I wiſh you great Succeſs in the Publication, and am with Sincerity,

Sir, your humble Servant,

JOHN FERGUSSON.

Academy, New Hermitage Street, July 8, 1765.

SIR,

I Have peruſed the following Sheets, and highly approve of the Plan, and the Method of laying it down; particularly, the 2d Part, concerning common Book-keeping, and Menſuration, which are ſo well executed, that I think they cannot fail to be of great Service to all ſuch who love to be improved in theſe Branches of Learning; and I heartily wiſh that you may meet with that due Encouragement that the Work deſerves.

I am, Sir, your Friend and humble Servant,

JOHN PROBERT.

Bow Free School, London, July 14, 1765.

SIR,

I Have peruſed this little Treatiſe, and recommended it to the *Teacher* and Pupil as a very uſeful one, and am perſuaded the young Accountant may find great Advantages from it,

Your Friend and well Wiſher,

DAVID TOWNE.

Academy, Preſcot-Street, Goodman's Fields, July 25, 1765.

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CONTENTS.

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THE

SCHOOLMASTER's

Moſt uſeful Companion,

AND

SCHOLAR's BEST INSTRUCTOR.

ARITHMETIC.

PART I.

INTRODUCTION.

Between a Tutor or Maſter and his young Pupil or Scholar.

Sch. WHAT *is* Arithmetic?

Maſt. It is that Art or Science, which teaches us to calculate, compute, or caſt up Numbers to an Exactneſs.

Sch. *How many Parts does* Arithmetic *contain?*

Maſt. Two, one called *Whole Numbers*, and the other *Fractions*, which you will ſoon underſtand by the following Sections.

SECT. I.

Of NOTATION, *commonly called* NUMERATION.

Sch. WHAT *is* Notation?

Maſt. Notation teaches us to note down any Series of Figures, and to expreſs any Number or Numbers to their juſt Value.

Sch. *How is this performed?*

Maſt. By Help of nine Characters called *Digits*, or *Figures*, as follows, *viz.* *One* (1), *Two* (2), *Three* (3), *Four* (4), *Five* (5), *Six* (6), *Seven* (7), *Eight* (8), *Nine* (9). Thus in Figures, 1, 2, 3, 4, 5, 6, 7, 8, and 9.

Sch. *Are theſe all the Figures uſed to expreſs all Manner of Numbers?*

Maſt. They are all the numerical Characters, and by the Help of a Cypher (0), or Cyphers (0000 *&c.*), they will increaſe Numbers infinitely, or not to be numbered by Expreſſion.

Sch. *Pray explain this?*

Maſt. I ſay, by adding or placing a Cypher (0) after any Figure, it makes, or increaſes, its Value ten Times more than it was before: Thus 1 by adding a Cypher (10) is *Ten*, or by adding 2 Cyphers (100) it becomes a *Hundred*; 3 Cyphers after it (1000) a *Thouſand*, *&c.* increaſing 10 Times more, as appears by the firſt of the two following Tables.

SECT. II.

NUMERATION.

N. B. X ſtands for *Tens*, and C for *Hundreds*, and every third Place of Figures is called *Hundreds* of a different Denomination.

TABLE I.

9	8	7	6	5	4	3	2	1	
								1	One or Unit.
							1	0	Ten.
						1	0	0	C. Hundred.
					1	0	0	0	Thouſand.
				1	0	0	0	0	X Thouſand.
			1	0	0	0	0	0	C Thouſand.
		1	0	0	0	0	0	0	Million.
	1	0	0	0	0	0	0	0	X Million
1	0	0	0	0	0	0	0	0	C Million.
Cs of Millions	*Xs of Millions*	*Millions*	*Cs of Thouſands*	*Xs of Thouſands*	*Thouſands*	*Hundreds*	*Tens*	*Units*	

TABLE

TABLE II.

9	8	7	6	5	4	3	2	1	
								1	Units.
							2	2	Tens.
						3	3	3	Hundreds.
					4	4	4	4	Thouſands.
				5	5	5	5	5	Xs of Thouſands.
			6	6	6	6	6	6	Cs of Thouſands.
		7	7	7	7	7	7	7	Millions.
	8	8	8	8	8	8	8	8	Xs of Millions.
9	9	9	9	9	9	9	9	9	Cs of Millions.

Cs of Millions | *Xs of Millions* | *Millions* | *Cs of Thouſands* | *Xs of Thouſands* | *Thouſands* | *Hundreds* | *Tens* | *Units*

OBSERVATIONS.

1. The firſt of theſe 2 Tables appears very natural and eaſy upon firſt Sight, every Place encreaſing exactly 10 Times more in Value towards the left Hand. The ſecond Table, only by obſerving the Places of Hundreds and Thouſands, *&c.* is alſo very eaſily underſtood.

2. You are to note every third Figure is called a Period or Place of 3 Figures, and is called Hundreds: Thus in Table II. the firſt 3 Figures (999) in the lower Claſs or Place of Millions, are thus pronounced, *Units, Tens, Hundreds*, that is, Nine Hundred and Ninety Nine; the firſt three above the Table are 321, and pronounced Three Hundred and Twenty-one: The next Period contains 3 more Figures in the Thouſand's Place, *viz.* 999,999, and are thus expreſſed, Nine Hundred, Ninety-nine Thouſand, nine Hundred and ninety-nine. — The ſix Figures above the Table, 654,321, are expreſſed after the ſame Manner, *viz.* Six Hundred fifty-four Thouſand, three Hundred and twenty-one. The next three Figures are the Period in the Place of Millions, ſtand thus, 999,999,999, and are expreſſed, Nine Hundred ninety-nine Millions, nine Hundred and ninety-nine Thouſand, nine Hundred and ninety-nine; and the Figures over the ſame Table, 987,654,321, are thus expreſſed, 9 Hundred, 87 Million, 6 Hundred, 54 Thouſand, 3 Hundred and 21. Thus by theſe Examples you may very eaſily number 9 Figures be they what they will.

Sch. I ſee the Nature of it very plainly, and want no more Examples.

Maſt. *Very well; then pray try and ſet down in Figures, all the following Numbers that are hereafter expreſſed in Words,* viz. Seven Hundred. — One Thouſand and Seven Hundred and Sixty-three. —— Twenty-four Thouſand, five Hundred and Nine.——Six Hundred, Forty-ſeven Thouſand, two Hundred and Ninety-ſeven.——Three Million, four Hundred and five Thouſand, ſeven Hundred and Eighteen, &c. ——— *Alſo ſet down in Figures the following Numbers, which you read of in Holy Scripture,* viz. Revelation, *Chap.* vii. One Hundred, forty-four Thouſand,—— *and* Iſaiah, *Chap.* xxvii. *v.* 36, One Hundred, fourſcore and five Thouſand. ——— *After you have done theſe, try and ſet down,* Eleven Thouſand, Eleven Hundred and Eleven.

Sc. I'll try at them, Sir, directly.

Maſt. *When you have done theſe, then try to expreſs or write down the following Numbers in Words,* viz. 507; 4901; 61708; 497,640; and 209,704,503.

Of Numbers expreſſed by Letter.

I.	1	One.
II.	2	Two.
III.	3	Three.
IV.	4	Four.
V.	5	Five.
VI.	6	Six.
VII.	7	Seven.
VIII.	8	Eight.
IX.	9	Nine.
X.	10	Ten.
XX.	20	Twenty.
XXX.	30	Thirty.
XL.	40	Forty.
L.	50	Fifty.
LX.	60	Sixty.
LXX.	70	Seventy.
LXXX.	80	Eighty.
XC.	90	Ninety.
C.	100	One Hundred.
CC.	200	Two Hundred.
CCC.	300	Three Hundred.
CCCC.	400	Four Hundred.

D.———— 500 Five Hundred.
DC.———— 600 Six Hundred.
DCC.———— 700 Seven Hundred.
DCCC.———— 800 Eight Hundred.
DCCCC.———— 900 Nine Hundred.
M.———— 1000 One Thouſand.
MM.———— 2000 Two Thouſand.
MDXLIX.——— 1549 One Thouſand five Hundred [and Forty-nine.
MDCCLXIV.——1764 One Thouſand ſeven Hundred [and Sixty-four.

SECT. III.

Of ADDITION.

Maſt. *WHAT is meant by* Addition?

Sch. It is the adding together different Numbers into one total Sum.

Maſt. *How many Sorts of* Addition *are there?*

Sch. Only Two, *viz. Simple* and *Compound* Addition.

Maſt. *What is* Simple Addition?

Sch. Numbers which contain one Denomination only; as Yards, Ells, Gallons, Tons, Pounds, *&c.*

Maſt. *How is this Sort of Addition performed?*

Sch. By this one common Method or

RULE.

Begin at the Unit's Place, and caſt up all the Figures, and for every *Ten* in the Unit's Place carry 1, or ſo many *Ones* to the Ten's Place as there are *Tens* in the Unit's Places; and for every *Ten* in the Ten's Place carry 1 to the Hundreds, and ſo on to the Place of Thouſands. — The Reaſon is; becauſe *ten Units* make *Ten*; *ten Tens* make a *Hundred*; and *ten Hundred* a *Thouſand*.

EXAMPLES.

Ex. 1. *Yds.*	Ex. 2. *Ells.*	Ex. 3. *Pounds.*	Ex. 4. *Gallons.*
1	24	217	5415
2	47	194	4176
3	52	215	2345
4	10	419	5217
5	14	255	9463
6	51	947	1764
7	93	456	5472
8	15	147	1545
9	26	318	3421
45			

Ex. 5. *Days.*	Ex. 6. *Hours.*	Ex. 7. *Years.*	Ex. 8.* *Minutes.*
4729	3487	97417	97417
6421	3004	00595	595
7158	7110	00017	17
4947	2497	41715	41715
7538	1076	00005	5
4717	3470	02074	2074
8207	4791	00090	90
9045	9146	17005	17005

* *N. B.* The 7th and 8th Examples are both alike; only the One has got Cyphers before the Figures, and the Other has the Cyphers left out, as it is much better; the Setting of Cyphers before Figures being quite out of Use, as it makes the Sum appear more full and much more intricate than it really is; for 00595 is only 595, and 00005 in the fifth Line is no more than 5, and, being set alone, is much easier to be cast up.

Of ADDITION *of* MONEY, *called* Compound Addition.

Mast. *How is* Addition *of* Money *performed?*

Sch. With very great Ease, by well observing the following Rules.

RULE.

RULE.

Four Farthings make a Penny, 12 Pence make a Shilling, and 20 Shillings a Pound Sterling. Or,

2dly, For every 4 in the Farthings carry 1 to the Pence; for every 12 in the Pence carry 1 to the Shillings; and for every 20 in the Shillings carry 1 to the Pounds, and caſt them up by *Tens* as you did in *Simple Addition*.

CHARACTERS *uſed in Addition*.

A *Farthing* ſignifies 1 Fourth of a Penny, marked thus ($\frac{1}{4}$).
A *Halfpenny* is 2 Fourths or 1 Half, marked thus ($\frac{1}{2}$).
And 3 *Farthings* is 3 Fourths of a Penny, marked thus ($\frac{3}{4}$).

N. B. The Figures (4), (12), (20), and (10), ſet over the Rows, ſhew how many you ſtop at, or what you do by in that Row: And *(£.)* ſtands for Pounds, *(s.)* for Shillings, and *(d.)* for Pence.

Ex. 1.

(10)	(20)	(12)
£.	s.	d.
4	9	6
3	4	2
9	5	3
2	7	4
19	6	3

Ex. 2.

(10)	(20)	(12)
£.	s.	d.
17	14	9
14	11	6
47	10	8
25	15	7

Ex. 3.

(10)	(20)	(12)
£.	s.	d.
147	17	6
215	14	9
402	11	7
176	15	11

Ex. 4.

(10)	(20)	(12(4
£.	s.	d.
9045	11	$8\frac{1}{4}$
4176	17	6
2196	14	$9\frac{1}{2}$
3090	17	$11\frac{3}{4}$

Note 1. I propoſe to do the firſt Sum in every Rule, in Order to give the young *Tyro* ſome Notion of what he is about: For the better Idea he has, conſequently it muſt be better both for his Inſtructor and himſelf.

Note 2. After the young Pupil has done theſe Sums, and three or four more, on a Slate or Piece of Paper, till he is perfect in theſe eaſy Examples; I ſhould then think it proper, that he learns the following Tables, before he goes upon longer and more difficult Sums.

Pence

Pence Tables.

Pence		*s.*	*d.*
20	is	1	8
30	is	2	6
40	is	3	4
50	is	4	2
60	is	5	0
70	is	5	10
80	is	6	8
90	is	7	6
100	is	8	4

Pence		*s.*
24	is	2
36	is	3
48	is	4
60	is	5
72	is	6
84	is	7
96	is	8
108	is	9
120	is	10

Table of Shillings.

s.		*£.*	*s.*
20	is	1	0
30	is	1	10
40	is	2	0
50	is	2	10
60	is	3	0
70	is	3	10
80	is	4	0
90	is	4	10
100	is	5	0

Ex. 5.

(10) *£.*	(20) *s.*	(12) *d.*
484	7	10¼
196	11	9
257	13	7½
146	19	4
904	11	7¼
546	8	5
194	12	3¾
718	10	11
472	11	9½
583	17	4
4506	4	11¼

Ex. 6.

(10) *£.*	(20) *s.*	(12) *d.*
976	14	11¼
137	19	2½
254	10	6¼
155	4	9¾
349	11	7¼
195	19	4½
926	4	9½
257	11	7¾
195	14	10¼
329	15	9½

Ex. 7.

(10) *£.*	(20) *s.*	(12) *d.*
4717	14	8
1295	15	10¼
9241	17	4
6417	11	8¾
1904	17	2
2007	5	9½
1763	12	7
3480	4	8
1784	11	4¼
8297	16	6½

Note 1. In these last Examples, and in every long Sum where the Pence and Shillings amount to a large Number, I would advise the Master to teach his Pupil to dot at, or stop at every 60 in the Place of Pence, and carry 5 Shillings for every such Dot or Period to the Place of Shillings; and also to stop at every 60 in the Place of Shillings, carrying 3 for every such Dot or Stop in the Shillings to the Place of Pounds.

Note 2. Above all Things let me advise YOU, that are Teachers of Children, not to make Use of unnecessary Cyphers, (as I said before in Exam. 7th and 8th in *Simple Addition,*) for they only puzzle the Learner, and hinder his Progress, by deceiving first his Eye-sight, and from thence confusing his Ideas.—Take only the following Example with and without Cyphers, and see which is most natural and practicable for him to do.

£.

l.	*s.*	*d.*		*l.*	*s.*	*d.*
748	14	01	- -	748	14	1
007	09	00		7	9	
000	00	10				10
215	17	04		215	17	4
196	00	02		196		2
005	09	11		5	9	11
000	15	00			15	

EXERCISES *in Simple Addition.*

Queſtion 1. What Number muſt be added to 1509 to make it equal to 1764?

Q. 2. A Boy had 241 Marbles given him; and he won at Play 175 at one Time, and at another Time 53; at another Time 9; at another Time 650; and one of his former Companions, who had left off Play, gave him 340: I demand how many he has in all?

Q. 3. A Perſon ſets out, and travels 8 Days as follows, the 1ſt Day 81 Miles; the 2d, 105; the 3d, 57; the 4th, 89; the 5th, 18; the 6th, 9; the 7th, he reſted; and on the 8th or laſt Day he went 243 Miles: How many Miles did he travel in all?

EXERCISES *in Money.*

Queſtion 1. What Sum of Money muſt I add to 214 *l.* 15*s.* 3*d.* to make the Sum 500 *l.*

Q. 2. A lent B at 4 ſeveral Times as follows; 28 *l.* 14*s.* 6*d.*; 15 *l.* 11*s.* 9$d.\frac{1}{2}$; 190 *l.* 10*s.* 9$d.\frac{3}{4}$; and a Bank Note of 50 *l.* What does the Whole amount to? Or what does Bowe to A in all?

Q. 3. A Gentleman ſent his Houſekeeper to Market, and ſhe laid out for Beef 13*s.* 4$d.\frac{1}{2}$, for Greens 9$d.\frac{1}{4}$, for Fiſh 7*s.* 8*d.* for Poultry 17*s.* 9$d.\frac{3}{4}$, and for Butter and Eggs 3*s.* 11*d.* What did ſhe lay out in all?

N. B.

N. B. Many ſuch natural and familiar Examples as theſe might be taught the young Beginner, and they would turn to much better Account than long and tedious Sums, which make them dread the Thoughts of an Operation; and, after all, will not fit and prepare their little Minds for the more ready caſting up ſuch uſeful Queſtions of ſmall Bills and Expences, which occur daily in almoſt every Circumſtance of Life and Buſineſs; and therefore my Advice is, that the more Examples he has of this Sort the better, till he is quite Maſter of ſuch Trifles, (as they are called,) and then he will with Eaſe perform Things of greater Conſequence.

More EXAMPLES.

In which the Money is only expreſſed, in Order for the young Scholar to ſet the ſame down in Figures, and then caſt it up.

Ex. 1. *A Houſekeeper's Bill of Diſburſements.*

1764.		£.	s.	d.
Ap. 13.	*Laid out for* 12 lb. *of Beef four Shillings and ſeven Pence* –			
14.	—— *Candles,* 10 *Groats* –			
16.	—— *Parſnips, Carrots, Greens, and Potatoes, fifteen Pence Halfpenny*			
17.	—— *Cheeſe and Butter, three Shillings and* 5 *Pence* – –			
18.	—— *Bread, One and Twenty Pence Halfpenny* – –			
19.	—— *Flour and Muſtard, thirteen Pence*			
	—— *A Piece of Iriſh, three Pounds four Shillings and nine Pence* –			
	In all			

Ex. 2. *A Book Debt.*

A Merchant propoſes to leave off Trade, and finds in his Books 6 Perſons ſtand in Debt to him as follows.

	£.	s.	d.
A *owes him One Hundred forty-ſeven Pounds, ſeventeen Shillings and nine Pence*			
B —— *Fifty-four Pounds and three half-pence*			
C —— *Two Thouſand Pounds and Sixpence*			
D —— *Seventeen Pounds, four Shillings*			
E —— *Six Thouſand and fifty Pounds, nine Shillings and four Pence Farthing* –			
F —— *One Hundred Pounds and 3 Farthings*			

How much is this in all ? *Anſwer*

Of Coins uſed in England.

	£.	s.	d.
A Guinea is	1	1	
Half a Guinea		10	6
A Moidore	1	7	
Half a Moidore		13	6
A Port	1	16	
Half a Port		18	
A double Port	3	12	

N. B. A Moidore has the Number 4000 upon it ; Half a Moidore 2000 ; a Quarter of a Moidore, or 6*s.* 9*d.* has 1000 upon it. — Thus may the Value of this Coin be known ; a 5 Moidore Piece is 5 Times 4000, *viz.* 20000, Value 5 Times 1*l.* 7*s.* or 6*l.* 15*s.*

A practical Queſtion.

Ex. 3. A Perſon commits the following Money to my Care, *viz.* 3 Moidores ; 47 Guineas ; 5 Ports ; 3 Half Ports ; 1 Half Moidore ; and 7*s.* and 3*d.*$\frac{1}{2}$ in Silver and Halfpence. How much does all this amount to ?

Anſwer. 66*l.* 2*s.* 9*d.*$\frac{1}{2}$.

A Cheesemonger's Bill.

Mr. *Roberts* bought of *Geo. Cream*, *February* 17, 1764.

			£.	s.	d.
A Cheshire Cheese	30 lb.	*at* 4*d. per* lb.		10	
4 *Glocester* —	40	*at* 3*d.* ½ —		11	8
2 *Warwickshire*	22	*at* 3*d.* ——		4	6
1 *Side of Bacon*	71	*at* 6*d.* ——	1	15	6
9 lb. *of Butter* ——		*at* 7*d.* ½ ——		5	7½
2 *Firkins of Butter*		*at* 28*s. per Firkin*	2	16	
5 lb. *of Ribs of Bacon*		*at* 8*d.* ½ *per* lb.		3	6½
		Total £.			

A Woollen-Draper's Bill.

Mr. *Farewell* bought of *John Snip*, *Feb.* 21, 1764.

1764.			£.	s.	d.
Feb. 4.	13 *Yds. of Shalloon*	*at* 1*s.* 9*d. per Yd.*	1	1	9
	5 *Yds. of Broad Cloth*	*at* 13*s.*	3	5	
7.	6½ *of Scarlet superfine*	*at* 21*s.*	6	16	6
	4½ *of Drugget*	*at* 5*s.* 6*d.*	1	4	9
Mar. 2.	11 *Yds. of Serge*	*at* 2*s.* 3*d.*	1	4	9
12.	5 *Yds of black hair Shag*	*at* 10*s.* 6*d.*	2	12	6
	15 *Yards of Frieze*	*at* 4*s.* 9*d.*	3	11	3
		Total £.			

A Grocer's Bill.

Mr. *Salmon* bought of *Wm. Sweet*, *Jan.* 5, 1764.

			£.	s.	d.
2 lb. *of Coffee* —		*at* 3*s.* 6*d. per* lb.		7	
2 *single refined Sugar Loaves*, 14 lb.		*at* 9*d.* ½		10	10½
1 *double refined* ——	6½ lb.	*at* 10*d* ½		5	8¼
28 lb. *of Sugar* ——		*at* 5*d.* ½		12	10
1 lb. *of Hyson Tea at* 16*s.*	1 lb. *of Bohea* 7*s.*		1	3	
3 Oz. *of Cloves*, 1 *of Ginger*, 1 *of Mace*				4	9
40 lb. *of Lisbon Sugar* —		*at* 6*d.* ½	1	1	8
15 lb. *of coarse Sugar* —		*at* 3*d.* ½		4	4½
49 lb. *of Malagas* ——		*at* 4*d.* ½		18	4½
2 lb. *of Chocolate* ——		*at* 5*s.* 6*d.*		12	6
Nutmegs and Cinnamon	—	—			7½
		Total £.			

A

A Stationer's Bill.

Mr. *Quilldrive* bought of *John Ragg*, *Feb.* 17, 1764.

	£.	s.	d.
12 *Ream of Fool's-cap, at* 14*s.* 6*d. per Ream*	8	14	
7 *Ream of Pot, at* 8*s.* 6*d.*	2	19	6
3 *Thousand Quills, at* 7*s.* 9*d. per Thousand*	1	3	3
1 *Box of Wafers, Pounce, and Sealing Wax*		1	7½
1 *large Accompt Book ruled*		8	6
2 *Skins of Parchment*		7	4
3 *Ream of Demy Paper at* 2*l.* 2*s. per Ream*	6	6	
1 *large black Pocket-Book gilt*		4	6
2 *Cash Books,* 3 *Quires, ruled*		5	
3 *Sheet Almanacks,* 1 *Pocket ditto*		1	5½
1 *Pocket Book, Vellum, ruled*		2	6
Total £.			

A Taylor's Bill.

Mr. *Nothought* Dr. to *Jonathan Snipclose.*

1764.		£.	s.	d.
Jan. 3.	*Making a full-trimmed Suit*	2	2	
	5½ *Yds. of Shalloon at* 2*s.* 3*d. per Yd.*		12	4½
	2 *Dozen of best gilt Coat Buttons*		5	6
	2 *Dozen of Waistcoat*		3	6
	Buckram, Canvas, and Stay Tape		3	9
	Silk, Twist, and Mohair		4	4
Feb. 12.	*Making a black Velvet Waistcoat*		4	6
	Silk, Twist, and Mohair		2	3
	Dimity and Pockets		1	4
	5 *Yds. of Lace at* 3*s.* 6*d. per Yard*		17	6
17.	*By seating* 2 *Pair of Breeches*		3	6
	Various Jobs in mending		2	8
25.	6 *Yds. of Fustian at* 2*s.* 9*d. per Yard*		16	6
	3½ *Yds. of Shalloon for the same at* 2*s.* 2*d.*		7	7
	Buckram, Stay Tape, &c.		1	9
	Silk, Twist and Mohair		2	7
	Making the Frock		7	6
	Total £.			

March 4, 1764, *Received the Contents of this Bill.*
Jonathan Snipclose.

☞ The foregoing Receipt is a ſufficient Example for all the preceding, or any other Bill, and the Form is adapted to Buſineſs; for there is no Occaſion to ſay *in full of all Demands*, except in long Reckonings and ſome particular Circumſtances, and then indeed Receipts are varied accordingly; of which you ſhall have a particular Account when we come to the End of the Rule of *Subtraction*, where we ſhall ſhew the Manner of ballancing and ſettling any common Accompts.

And now, my young Tyro, if you are perfect in what has been laid down, you may proceed to Weights and Meaſures, and

I. *Of* AVOIRDUPOIZE WEIGHT.

Sch. What is the Uſe of this Rule?

Maſt. All heavy and coarſe Commodities are weighed by this Rule, ſuch as *Hops*, *Iron*, *Nails*, *Grocery*, *Chandlery Wares*, and almoſt every Commodity, except Gold, Silver, and ſome few other Things.

Sch. What are the Diviſions of the different Weights in this Rule?

Maſt. They are divided into Tons, Hundreds, Quarters, Pounds, Ounces, and Drams, as follows in the Table.

16 Drams (drm or ʒ) make an Ounce,
16 Ounces (oz.) make a Pound,
28 Pounds (℔) 1 Quarter or a Hundred Weight,
4 Quarters (qrs) 1 Hundred Weight or 112 ℔.
20 Hundred Weight (cwt) 1 Ton.

(10) (20) (4) (28)			
T.	C.	qr.	℔.
24	14	2	11
49	10	1	17
23	11	2	15
41	5	1	11
17	2	3	15
25	14	1	13

(10) (4) (28) (16)			
C.	qr.	℔.	oz.
17	2	17	11
41	3	15	10
29	1	17	15
47	2	14	5
67	1	23	2
15	3	11	10

(10) (28) (16) (16)			
qr.	℔.	oz.	drm.
17	14	11	12
25	17	10	14
19	27	6	13
47	15	13	10
56	11	4	11
17	5	9	14

A practical Queſtion.

A Hop Merchant bought 5 Bags of Hops, weighing as follows; (N°. 1.) 4 cwt. 1 qr. 21 ℔. (N°. 2.) 2 cwt. 3 qr. 10 ℔. (N°. 3.) 3 cwt. 2 qr. 17 ℔. (N°. 4.) 3 qr. 27 ℔. (N°. 5.) 1 cwt. 3 qr. I demand what the whole weighs?

Anſwer. 13 cwt. 2 qr. 19 ℔.

II. *Of* TROY WEIGHT.

Sch. What is the chief Uſe of this Rule?

Maſt. All Liquids, and ſome particular Things, ſuch as Bread, Gold, Silver, Jewels, Apothecaries Drugs, *&c.* are weighed by this Rule.

Sch. What are the Denominations of this Rule?

Maſt. Pounds, Ounces, Pennyweights, Grains, and Carrats, as follows in the

TABLE.

24 Grains (gr.) make a Pennyweight,
20 Pennyweights (dwts) an Ounce,
12 Ounces (oz.) a ℔.

N. B. A Carrat is no certain Weight, but is the 24th Part of any promiſcuous Quantity. — Therefore in any Maſs to be mixed, 22 Parts or Carrats of fine Gold, mixed with 2 Carrats of good Copper, is the Standard for Engliſh Gold Coin; and 11 oz. 2 dwts. of fine Silver, and 18 dwts. of good Copper, melted, is called true Sterling Silver.

(10) ℔.	(12) oz.	(20) dwts.
41	11	17
27	9	11
45	4	9
17	5	2
91	10	18
27	9	15

(10) ℔.	(12) oz.	(20) dwts.
97	11	15
16	10	17
49	9	15
56	4	9
72	7	4
81	11	18

(10) ℔.	(12) oz.	(20) dwts.	(24) gr.
47	10	17	21
94	3	15	17
72	5	17	23
27	6	15	11
61	11	10	9
15	7	15	15

A practical Queſtion.

Bought of a Silverſmith as follows, 6 Tea-ſpoons, weighing 2 oz. 10 dwts. 15 gr. 6 large Spoons, 2 ℔. 3 oz. 17 dwts. 1 Pint Saucepan, 9 oz. 9 dwts. 12 gr. 1 Pint Mug, 11 oz. 17 dwts. and a Cream Pot, 3 oz. 14 dwts. 15 gr. How much do all weigh?

Anſwer. 4 ℔. 7 oz. 8 dwts. 3 grs.

Sch. I thank you, Sir, but pray what is the Difference between Avoirdupoize *and* Troy Weight?

Maſt. You are to remember that 1 ℔. Avoirdupoiſe is equal to 14 oz. 11 dwts. 15½ gr. Troy; and 1 ℔. Troy is equal to 13 oz. 2½ drms. $\frac{9}{35}$ Avoirdupoize.

Of CHEMISTS *or* APOTHECARIES WEIGHT.

Sch. What are the principal Denominations and Characters of this Weight?

Maſt. They will appear by the following

TABLE.

20 Grains (gr.) make a Scruple (℈),
3 Scruples 1 Dram (ʒ),
8 Drams 1 Ounce (℥),
12 Ounces 1 Pound (℔).

There is no Occaſion for any long Examples in this Rule, it being ſo ſeldom required in Practice but to the Profeſſion itſelf: However, I ſhall give one Example.

A practical Queſtion.

A Chemiſt or Apothecary mixes 2℥ 5ʒ of Syrup with 3℥ 4ʒ of rectified Spirits of Wine; and alſo 5ʒ 2℈ 15 gr. of the Bark with 4℥ 3ʒ 1℈ 8 gr. of Mint Water. How much do all theſe weigh?

Anſwer. 11℥ 2ʒ 1℈ 3 gr.

IV. *Of* DRY MEASURE.

Sch. What is Dry Meaſure?

Maſt. It is the Rule by which almoſt all dry Goods are meaſured, ſuch as Wheat, Barley, Rye, Oats, Beans, Peas, Coal, Seed, and other Grain; and alſo Sea Coal and Small Coal.

Sch.

Sch. What are the Names of the different Meaſures of this Rule?

Maſt. You will ſee by the following Tables.

TABLE I. *Corn Meaſure.*

2 Pints	make	1 Quart.
2 Quarts	—	1 Pottle or ½ Gallon.
2 Pottles or 4 Quarts	—	1 Gallon.
2 Gallons	—	1 Peck.
4 Pecks	—	1 Buſhel.
4 Buſhels	—	1 Coome.
2 Coome	—	1 Seam or Quarter.
5 Quarters or 40 Buſhels	—	1 Load.
2 Loads	—	1 Wey.

TABLE II. *Coal Meaſure.*

4 Pecks.	—	1 Buſhel.
3 Buſhels	—	1 Sack.
12 Sacks or 36 Buſhels	—	1 Chaldron.

Note 1. That 5 Buſhels make a Sack of Flour, and in Bran you have double Meaſure, that is, 2 Buſhels for 1.

Note 2. In Coal Meaſure there is an Allowance of 1 Chaldron in 20, that is, he that buys 20 Chaldron has 21.

V. *Of* LIQUID MEASURE.

Sch. What do you call Liquid Meaſure?

Maſt. That Standard or Rule by which all Liquids, ſuch as Beer, Wine, Rum, Brandy, Spirits, Strong Waters, Cyder, Perry, Vinegar, Oils, *&c.* are meaſured.

Sch. Are there not 2 Sorts of Meaſures?

Maſt. Yes, one is called *Beer Meaſure* or *Wincheſter Meaſure*; the other is called *Wine Meaſure.*

Sch. Pray give me an Account of their Difference?

Maſt. I will.

I. *Beer and Ale Meaſure.*

TABLE.

2 Pints	make	1 Quart.
4 Quarts	—	1 Gallon.
8 Gallons	—	1 Firkin of Ale.
9 Gallons	—	1 Firkin of Beer.

2 Firkins	make	1 Kilderkin or ½ a Barrel.
2 Kilderkins	—	1 Barrel or 36 Gallons.
1½ Barrel or 54 Gallons		1 Hogſhead.
2 Hogſheads	—	1 Butt.

N. B. That in *London*, according to the Exciſe Rule, 32 Gallons make a Barrel of Ale, and 36 a Barrel of Beer; but in other Counties in England the Exciſe reckons 34 Gallons to a Barrel, both of Ale, Strong Beer, and Small.

II. *Of Wine Meaſure.*

TABLE.

2 Pints	make	1 Quart.
4 Quarts	—	1 Gallon.
8 Gallons to 10	—	1 Anchor of Brandy [or ſpirituous Liquors.
18 Gallons	—	1 Runlet.
42 Gallons	—	1 Tierce.
63 Gallons	—	1 Hogſhead.
84 Gallons (or any Meaſure from 63 to 100)	—	1 Puncheon.
2 Hogſheads or 126 Gallons		1 Pipe.
2 Pipes	—	1 Tun.

(10) Butts.	(2) hds.	(1½) bar.	(2) kil.	(2) firk.	(9) gal.	(10) Beer bar.	(2) kil.	(18) gal.
47	1	1	1		5	645	1	16
29	1		1		4	179		14
14	1	1			6	915	1	10
16	1		1	1	5	476		15
27	1	1		1	2	172	1	17
15	1	1	1		7	649	1	11

VI. *Of* CLOTH MEASURE.

Sch. What are the Diviſions of Cloth Meaſure?

Maſt. They are as follows.

TABLE.

TABLE.

4 Nails make a Quarter of a Yard,
3 Nails make a Quarter of an Ell Flemiſh,
5 Nails a Quarter of an Ell Engliſh.
N. B. An Ell Engliſh is 1 Yard 1 Quarter.

(10) yds.	(4) qrs.	(4) nls.	(10) ells E.	(4) qrs.	(5) nls.	(10) ells F.	(4) qrs.	(3) nls.
41	3	2	47	2	4	49	2	1
24	2	3	19	3	2	17	1	2
92	1	1	41	1	3	47	2	1
68	3	1	17	2	1	19	1	2
17	1	3	16	1	4	27	2	1
21	2	2	17	2	1	19	2	1

VII. *Of* LONG MEASURE.

Sch. What are the Denominations of this Meaſure?
Maſt. They are as follows.

TABLE.

3 Barley-corns	make	1 Inch.
12 Inches	—	1 Foot.
3 Feet	—	1 Yard.
5½ Yards	—	1 Rod or Pole.
40 Rods or Poles	—	1 Furlong.
8 Furlongs	—	1 Mile.
3 Miles	—	1 League.
20 Leagues	—	1 Degree of a Circle.

360 Degrees make a whole Circle, or the Circumference of the Globe of the Earth and Sea.

N. B. 60 Miles is commonly called a Degree; but 69½ Miles is a Degree in the Arch of any great Circle.

(10) Deg.	(20) leag.	(3) m.	(8) fur.	(40) rods.	(5½) yds.	(3) ft.	(12) inch.	(3) bar. cor.
241	17	2	5	27	2	2	10	2
176	11	1	2	15	1	1	11	1
204	14	1	3	31	1		9	2
176	9	1	2	14	1	1	5	1
317	4	1	3	21		2	11	2
415	15	2	7	15	3	1	4	1

Sch. What are the different Diviſions or Denominations of this Rule?

Maſt. See the following Table.

TABLE.

3 Feet	make	1 Yard.
5 Yds. ½ or 11 Half Yds.		1 Rod or Pole.
40 Rods in Length 1 Rod in Breadth		1 Rood.
4 Roods		1 Acre.

N. B. In caſting up 5½ Yards to a Rod it is very puzzling to Seamen, therefore it is frequently done by Half Yards, *viz.* by 11, as in Example 2; and in *Reduction* hereafter you will ſee the real Neceſſity of multiplying by 11, much rather than 5½.

(10) Acres.	(4) roods.	(40) rds.	(5½) yds.
147	3	19	3½
429	1	28	4
217	3	17	3
41	1	15	2
9	2	27	1
217	1	31	4

(10) roods.	(40) rds.	(11) hf yds.
17	29	10
91	17	5
27	19	7
14	21	9
91	15	10
45	27	2

SQUARE

SQUARE MEASURE.

Sch. What are the Denominations of this Rule? and what is its Uſe?

Maſt. The Uſe of this Rule is to meaſure Boards, Glaſs, or all flat ſuperficial Meaſure; the Uſe of which you will practically ſee in *Multiplication* and *Reduction*. —— The Denominations are as follow.

TABLE.

16	ſquare Quarters	—— make ——	1	ſquare Inch
144	—— Inches	—— ——	1	—— Foot
9	—— Feet	—— ——	1	—— Yard
30¼	—— Yards	—— ——	1	—— Rod
160	—— Rods	—— ——	1	—— Acre
102400	—— Rods, or 640 ſquare Acres,		1	—— Mile.

N. B. There is no Occaſion for any Example in this Rule, as it ſeldom or never occurs in Addition; we ſhall therefore ſpeak of it in *Multiplication* and *Reduction*, and then the young Pupil will ſee the Nature of it.

Of TIME.

Sch. What are the Diviſions of Time?

Maſt. You will ſoon underſtand it by the following Table.

TABLE.

60	Seconds or Moments —	make ——	1 Minute
60	Minutes ——	—— ——	1 Hour
24	Hours ——	—— ——	1 Day
7	Days ——	—— ——	1 Week
4	Weeks ——	—— ——	1 Month
13	Months, or 52 Weeks, or 365 Days,		1 Year.

N. B. Every 4th Year is a Leap-Year, and that conſiſts of 366 Days.

(10) Yrs.	(13) M.	(4) W.	(7) D.	(24) H.	(10) Ds.	(24) H.	(60) M.	(60) S.
56	11	3	6	21	167	17	26	49
14	9	2	3	17	224	19	19	19
17	3	1	5	11	192	17	27	25
45	12	2	3	15	921	21	35	27
96	5	1	2	21	176	14	47	15

Of THINGS *neceſſary to be known in Buſineſs.*

I. *Of* WEIGHTS *and* MEASURES.

A Barrel of Anchovies from 18 to 25 lb. — A Barrel of Ale 32 Gallons, a Barrel of Beer 36 Gallons. — A Barrel of Figs from 100 to 300 lb. — A Barrel of Gunpowder 112 lb. — A Barrel of Herrings 500 lb. — A Cade of Herrings 500 in Number. — A Cade of Sprats 1000. — A Clove of Cheeſe 8 lb. — A Clove of Wool 7 lb. — A Dicker of Leather 10 Skins. — A Fathom 6 Feet. — A Furlong 40 Rods or 220 Yards. — A Firkin of Butter 56 lb. — A Firkin of Soap 64 lb. — A Keg of Herrings 60. — A Laſt of Leather 24 Dickers. — A Laſt of Tar 14 Barrels. — A Laſt of Gunpowder 24 Barrels. — A Laſt of Corn 2 Loads. — A Load 5 Quarters or 40 Buſhels. — A Load of Hay from 25 to 30 Hundred Weight. — A Load of Bricks 500. — A Load of Tiles 1000. — A Puncheon of Rum from 70 to 100 Gallons. — A Puncheon of Prunes from 8 to 12 Cwt. — A Quintal of Fiſh 100. — A Quintal from 100 to 112 lb. — A Rod in Length $5\frac{1}{2}$ Yards or $16\frac{1}{2}$ Feet. — A ſquare Rod $30\frac{1}{4}$ Yards or $272\frac{1}{4}$ Feet. — A Square of Tiling, Roofing, or Thatching, 100 Feet ſquare, that is, 10 Times 10. — A Stack of Wood 3 Feet in Height, 3 Feet deep, and 12 Feet long, which is 108 cubic Feet; but in ſome Places a Stack is 3 Feet high, 4 Feet deep, and 12 long, which makes 144 cubic Feet. — A Ton is 20 Cwt. — A Ton of Lead $19\frac{1}{2}$ Hundred Weight. — A Tun of Wine 252 Gallons. — A Tun of ſweet Oil 236 Gallons. — A Truſs of Hay from 50 to 60 lb. — A Wey 5 Chaldron.

Chaldron. — A Wey of Cheeſe in Eſſex is 256lb. in Suffolk 336lb.

II. *Of* PAPER, *&c.*

Twenty-four Sheets make a Quire, 20 Quires 1 Ream, 12 Reams 1 Bale. — 5 Dozen of Skins make a Roll of Parchment. — 110 Sheets in Books make or are reckoned to the Hundred.

III. *Of* GOLD, SILVER, *&c.*

One Grain of Gold is valued at 2 Pence. — 1 Pennyweight at 4*s.* — 1 Ounce at 4*l.* — A Pound 48*l.* — A Grain of Silver about ½ a Farthing. — A Pennyweight 3 Pence. — An Ounce 5*s.* — A Pound about 3*l.*

SECT. IV.

SUBTRACTION.

Sch. *WHAT is* Subtraction?

Maſt. The Reverſe of *Addition*; for *Addition* you remember taught you to add different Numbers into one Sum or Total; but *Subtraction* teaches us to take a *leſs* Number out of a *greater*, to diſcover the true Difference.

Sch. How is Subtraction *performed?*

Maſt. Thus.

RULE.

Take the lower from the Top Figure, and ſet down the Difference or Remainder under them; but if the lower Figure be larger than the Top, then take it out of what you do by, and take in or add the Top Figure beſides, and this is the true Difference. But always remember, when you take it out of what you do by, you are to carry 1 to the next Figure for ſo doing.

Ex.

	Ex. 1.	Ex. 2.	Ex. 3.	Ex. 4.	Ex. 5.
From	9	17	45	427	4735
Take	5	9	23	215	1324
Difference	4*	8*	22*		
Proof	9	17	45		

	Ex. 6.	Ex. 7.	Ex. 8.
From	49215	694765	6914945
Take	24105	412321	314925
Remainder			
Proof			

	Ex. 9.	Ex. 10.
From	2192463405	6917620019
Take	1040462002	4102101010
Remainder		
Proof		

To prove SUBTRACTION.

Add the Difference or Remainder to the leſs or lower Number, and if the Sum be the ſame as the greater or Top Number, the Work is right, otherwiſe falſe.

*** Thus in Examples 1, 2, and 3, I add 4, the Remainder or Difference, to 5 the leſs Number, and their Sum is 9, the Top Number. Alſo I add 8 to 9, it makes 17. And in Example 3, I add 22 to 23, and it makes 45.

Sch. I underſtand you, Sir, very well. But how am I to ſubtract or take the lower Figure out of the Top one, when the lower Figure is larger than the Top?

Maſt. Turn to the Rule again, and obſerve it well, and you will ſoon underſtand it. However I will give you an Example or two, and ſhew you.

Ex.

Ex. 11.	Ex. 12.	Ex. 13.
From 4734*	9207	562417
Subtract 1547	1349	93345
Remain 3187		
Proof 4734		

* Here in Ex. 11. I find the Bottom Figure 7 cannot be subtracted out of the Top Figure 4; therefore I say, 7 from 4 I cannot have, but 7 from 10, (which remember is what you do by in whole Numbers,) there remains 3, and the Top Figure 4 added besides makes 7; then I carry 1 to the next lower Figure, which is 4, and it makes 5; but 5 from 3 I cannot, therefore I say 5 from 10 there remains 5, and 3 I take in is 8; or say 5 from 13 there remains 8; then I carry 1 to 5 is 6, which taken from 7, there remains 1 without borrowing; therefore I now carry Nothing, but only say 1 from 4 there remains 3; you may prove the Work as before, by adding the Remainder to the less Number.

Sch. I thank you, Sir.
Mast. Here follows

MORE EXAMPLES.

From 401923	762195	876201987
Take 132405	263750	196042798
Remain		
Proof		

From	4219624635	and	7090416370
Subtract	271600797	and	34769183
Remain			
Proof			

Of MONEY.

This is performed the ſame as whole Numbers, for if the lower Figure is larger than the Top one, then take the lower Fignre out of what you do by, *viz.* 4 at Farthings, 12 at Pence, 20 at Shillings, and 10 at Pounds.

Note 1. When the lower Figure or Figures are leſs than the Top ones, only ſubtract or take one from the other, and ſet down the Remainder in the Place of Farthings, Pence, Shillings, and Pounds.

EXAMPLES.

	(10)	(20)	(12)	(10)	(20)	(12)	(10)	(20)	(12)
	£.	*s.*	*d.*	*£.*	*s.*	*d.*	*£.*	*s.*	*d.*
From	9	7	6	46	17	11	647	14	9
Subtract	3	2	3	21	8	9	325	10	2
Remain	6	5	3*						
Proof	9	7	6						

* Here you ſee, my young Scholar, that in the *firſt* of theſe Examples, I only ſubtract the ſecond Line or lower Sum out of the Top one, and there remains 6*l.* 5*s.* 3*d.*— To prove this, I add the Remainder, or Anſwer, 6*l.* 5*s.* 3*d.* to the leſs Sum, 3*l.* 2*s.* 3*d.* ſaying 3 and 3 is 6; 5 and 2 make 7; and 6 and 3 is 9. — Proceed the ſame with the other 2 Examples, and you will be fit for the following

EXAMPLES.

	£.	*s.*	*d.*	*£.*	*s.*	*d.*	*£.*	*s.*	*d.*
From	423	5	9	647	14	6	6945	17	6
Take	121	3	6	134	9	3	1413	14	5
Remains									
Proof									

	(10)(20)(12)(4			(10)(20)(12)(4			(10)(20)(12)(4		
	£.	s.	d.	£.	s.	d.	£.	s.	d.
From	476	17	4 ½	494	13	7 ¾	6470	14	6 ½
Take	124	8	3 ¼	160	12	5 ¼	1460	9	5 ½
Remain									
Proof									

	£.	s.	d.	£.	s.	d.	£.	s.	d.
From	9470	14	6 ¼	6004	12	6 ½	7219	4	11 ½
Subtr.	1060	11	5	1003	9	2	117	3	9 ¼
Remain									
Proof									

EXAMPLES *when the lower Figure is ſometimes larger than the Top.*

Note 2. When the Farthings, Pence, or Shillings, in the Sum to be ſubtracted, are larger than thoſe in the Top Sum, or what you are to ſubtract from, then take the lower Figure from what you do by, or ſtop at, *viz.* by 4, by 12, or 20, and take in or add the Top Figure to the Remainder, and carry 1 to the next Place for ſo doing, as you did in whole Numbers.

	£.	s.	d.	£.	s.	d.	£.	s.	d.
From	47	10	7 ½	671	14	6	975	11	7 ½
Take	18	12	8 ½	192	15	9	364	5	9 ¼
Remain	28	17	10 ¾*						
Proof	47	10	7 ¼						

* Here in Example 1. you ſee that you cannot take a *Halfpenny* out of a *Farthing*; therefore I ſay, a Halfpenny or 2 Farthings from a Penny or 4 Farthings, (what you do by,) there remain 2 Farthings, and 1 Farthing I take in beſides from the Top Line make 3 Farthings. — Then be-

cauſe I borrowed, I carry 1 to 8 in the Pence Place, which makes 9; now 9 Pence from 7 I cannot take, but 9 Pence from 12 Pence (what I do by) there remain 3 Pence, and the 7 Pence at Top added to it make 10 Pence. — Then I carry 1 to the Shillings becauſe I borrowed 12 in the Pence, and ſay 1 I carry to 12 makes 13; but 13*s.* from 10*s.* I cannot take, therefore I ſay 13 from 20 Shillings (what I do by) there remains 7, and the 10 Shillings on the Top Line added makes 17. — Then I carry 1 to 8 in the Pounds, which makes 9, and ſay 9 from 7 I can't, but 9 from 17 there remains 8, then I carry 1 to 1 makes 2, which taken from 4 there remains 2. —— *Proof.* 3 Farthings and 2 make 5 Farthings, which is 1 Farthing above a Penny; carry 1 to 10 Pence is 11, and 8 Pence is 19 Pence, which is 7 Pence above 1 Shilling or 12 Pence. — Carry 1 to 17 Shillings is 18, and 12 make 30 Shillings, which is 10 above 20. — Then I carry 1 to 8 is 9, and 8 is 17, which is 7 above 10, and I carry 1 to 2 is 3 and 1 is 4. —— Thus, my dear Pupil, I have gone through the whole Work of the firſt Operation, by which with very little Trouble you may perform all the Operations in *Subtraction*.

More EXAMPLES.

	£.	*s.*	*d.*	£.	*s.*	*d.*	£.	*s.*	*d.*
From	476	14	$6\frac{1}{4}$	4570	2	6	670	10	$7\frac{3}{4}$
Take	198	7	$9\frac{3}{4}$	978	3	$9\frac{1}{2}$	129	10	9
Remain									
Proof									

Practical Queſtions for Buſineſs.

1. Maſter *Tommy Bountiful* lent Maſter *Billy Want* 2 Guineas; and *Billy* paid him at one Time 5*s.* 6*d.* at another Time Half a Guinea, at another Time 15*s.* I demand what remains ſtill due to Maſter *Tommy*?

Anſwer. 11*s.*

2. A borrowed of B 100*l.* and B paid at one Time 15 Guineas, at another Time 30 Guineas, at another Time 20*l.* and, by a Bank Bill, 25*l.* 5*s.* I demand what is the Balance, or what is ſtill due from A to B?

Anſwer. 7*l.* 10*s.* due to B.

AVOIRDUPOIZE WEIGHT.

	(10) Tons	(20) cwt.	(4) qr.	(28) lb.	(16) oz.	(10) Cwt.	(4) qr.	(28) lb.	(16) oz.	(16) dr.
From	47	11	1	17	10	671	2	17	10	8
Take	19	17	1	14	12	194	1	21	11	10
Remain										
Proof										

Note. This and all the following Sums are done in the ſame Manner as Addition of Money, only always remember, that when the lower Figure is larger than the Top, take it out of what you do by, and then add the Top Figure beſides, and that is the true Remainder. — Then carry 1 to the next for ſo doing, as was ſaid before, and you will find the Operation ſoon done to your Satisfaction.

TROY WEIGHT.

	(10) lb.	(12) oz.	(20) dwts.	(24) gr.	(10) lb.	(12) oz.	(20) dwts.	(24) gr.
From	47	3	17	16	647	10	11	20
Take	19	9	16	21	192	11	9	23
Remains								
Proof								

DRY MEASURE.

	(10) Loads	(5) qrs.	(8) buſh.	(4) pecks.	(10) Chald.	(36) buſh.	(4) pecks.
From	64	2	5	2	1696	21	2
Takes	17	3	3	3	947	27	3
Remains							
Proof							

LIQUID MEASURE.

I. *Beer Meaſure.*

	(10) Tuns	(2) bts.	(2) hhs.	(1½) bar.	(2) kil	(18) gall.	(10) Bar.	(36) gal.	(4) qu.
From	271	1	1	1		14	364	17	2
Take	196		1		1	16	176	25	3
Remain									
Proof									

II. *Wine Meaſure.*

	(10) Tuns	(2) pip.	(2) hh.	(63) gall.	(10) Hhd.	(63) gal.	(8) pints.
From	57	1		27	65	17	5
Take	19		1	15	19	51	6
Remain							
Proof							

CLOTH

CLOTH MEASURE.

	(10) Yds.	(4) qrs.	(4) nls.	(10) Ells E.	(4) qrs.	(5) nls.	(10) Ells F.	(4) qrs.	(3) nls.
From	65	3	2	274	2	3	351	2	1
Take	19	3	3	196	3	4	193	2	2
Remains									
Proof									

LONG MEASURE.

	(10) Deg.	(20) leag.	(3) m.	(8) fur.	(40) rods.	($5\frac{1}{2}$) yds.	(3) ft.	(10) Yds.	(36) inch.	(3) bc.
From	24	14	2	4	23	2	1	476	21	1
Take	19	17	1	5	27	1	2	191	27	2
Anſwer										
Proof										

LAND MEASURE.

	(10) Acres.	(4) roods.	(40) rds.	(10) Acres.	(4) roods.	(40) rds.
From	194	2	27	647	2	31
Take	79	2	30	174	3	37
Anſwer						
Proof						

TIME.

	(10) Yrs.	(13) M.	(4) W.	(7) D.	(10) Wks.	(7) D.	(24) H.	(60) M.	(60) S.
From	47	7	2	4	164	2	17	41	27
Take	19	20	2	5	97	3	21	47	30
Anſwer									
Proof									

EXAMPLES *to exerciſe the Rules of* ADDITION *and* SUBTRACTION.

1. A Perſon in the Year 1764 being aſked how long it was ſince *William the Conqueror* reigned, ſaid he could not immediately tell; but he remembered it was in the Year 1066. I demand how many Years it was ago?

Anſwer. 698 Years.

2. A Boy had 1000 Marbles: He ſold 290, he gave away 3 Score, and he loſt at Play 437. I demand how many he has left?

Anſwer. 213.

3. Two Travellers, A and B, ſet out from two different Places, which lie diſtant from each other 327 Miles: A travels 21 Miles the 1ſt Day, 40 Miles the 2d Day, and 51 Miles the 3d Day. B travels the 2 firſt Days 40 Miles each, the 3d Day he travels 57 Miles, the 4th Day he goes 32 Miles. I demand now how far A and B both travelled, and how many Miles they are ſtill diſtant from each other?

Anſwer. A traveiled in all 112 Miles, B travelled in all 169, and they are ſtill diſtant 146 Miles.

4. A Houſekeeper received of her Maſter 2 Guineas and a Half to go Market: She laid out for Fowls and Bacon 8*s.* 7*d.* ½, for Greens 4*d.* ½, for Beef 7*s.* 9*d.* for Veal 5*s.* 10*d.* ½, for Pigeons 3*s.* 6*d.* for Pies and Tarts 4*s.* 6*d.* I demand what ſhe has laid out in all, and what is the Balance due to her Maſter?

Anſwer. Due to her Maſter 1*s.* 10*d.* ½.

5.

5. A Gentleman gave his Servant or Houſekeeper 10 Guineas on the *Monday* to provide every Thing for the Family for the whole Week; and on *Saturday* Evening ſhe brought in her Accounts of Diſburſements as follows: Laid out on *Monday* 1 *l.* 11 *s.* 6 *d.* ½, on *Tueſday* 14 *s.* 7 *d.* on *Wedneſday* 10 *s.* 9 *d* ¼, on *Thurſday* 18 *s.* 6 *d.* on *Friday* 2 *l.* 17 *s.* 11 *d.* and on *Saturday* 4 *l.* 7 *s.* 10 *d.* I demand what is the Balance, and to whom due?

Anſwer. There is due to the Houſekeeper, 11 *s.* 1 *d.* ¾.

6. A Steward reckoned with one of his Lord's Tenants who owed him a Year and a Half's Rent in a Farm of 450 *l.* The Tenant has paid at one Time 50 *l.* at another Time 20 Guineas, at another Time 30 Guineas; Repairs by Carpenter's Bills 27 *l.* 14 *s.* 9 *d.* by Bricklayer's 21 *l.* 11 *s.* 7 *d.* by Land-Tax Bills 83 *l.* 17 *s.* 9 *d.* and by a Bill paid by Order 175 *l.* 8 *s.* 6 *d.* I demand what is the Balance, and to whom due?

Anſwer. Due ſtill to the Landlord, 38 *l.* 17 *s.* 5 *d.*

A RULE *to work all ſuch like Queſtions.*

Note, My dear young Tyro, always remember to read the Sum two or three Times over very ſlow and attentively, and then obſerving well the Debt, or what is owing; place that down firſt; then proceed to ſet down all the leſſer Sums, or whatever has been paid, one under another in Order; and then take or ſubtract their Sum or Total out of the firſt Number or Debt, the Remainder will be the Balance.

Note 2. Sometimes it may happen, that what is paid may be more than what is borrowed, *&c.* — Be this as it will, you muſt ſtill ſubtract the leſs Number from the greater, and it will be eaſy to ſee which is the Side, or to whom the Balance is due, if you will duly attend to the Queſtion.

Take an Example.

A Gentleman puts into a Banker's Hand 5000 *l.* and draws out at one Time 1748 *l.* 10 *s.* at another Time 659 *l.* 14 *s.* 6 *d.* at another Time 2000 *l.* at another Time 549 *l.* 11 *s.* I demand the Balance, and to whom due?

Anſwer. Due to the Banker 352 *l.* 15 *s.* 6 *d.* — That is, the Gentleman has drawn out of the Banker's Hand 352 *l.* 15 *s.* 6 *d.* more than the Banker had of him.

Note

Note 3. Sometimes it happens that there are very long and tedious Reckonings between two Parties, both having paid Mnney to, and received Caſh of, each other, in Part, for various Commodities, and the Accompts often become very intricate for Want of being duly ſettled In ſuch Caſes as theſe, the following Example and Diſcharge will be highly neceſſary.

EXAMPLE.

William Snip the Taylor, and *Richard Tripe* the Shoemaker, had a Reckoning of three Years and a Half ſtanding, and each of them ſuppoſed the other to owe him Money upon Balance; but at laſt a Day was ſet and they reckoned, and there appeared due to Mr. *Snip* the Taylor, 5*l.* 14*s.* 6*d* but Mr. *Tripe* could not pay the Balance. — I demand what Sort of a Note Mr. *Tripe* ought to give to Mr. *Snip?*

Anſwer. As follows:

June 24, 1764. *Reckoned and balanced all Accompts between me and Mr. William Snip to this Day: And I acknowledge myſelf to be indebted to the ſaid William Snip, Five Pounds, fourteen Shillings and Sixpence, upon the Balance thereof, which I promiſe to pay to him or Order on Demand, for Value received.*

Atteſted *Witneſs my Hand,*
John Truſty. *Richard Tripe.*

N. B. This is a proper Form after ſettling long Reckonings, and the Note ſhould be atteſted by a Witneſs.

SECT. V.

MULTIPLICATION.

Sch. *WHAT is* Multiplication, *and what does it teach us?*

Maſt. *Multiplication* is inſtead of, or anſwers the End of, many *Additions*; and therefore it teaches us to multiply one Number by another to tell the Product, Rectangle, or Content of ſuch Numbers. For ſuppoſe I was to add the Number

Number 12, 7 Times together; I ſhould be obliged by the Rule of *Addition* to ſet the Number 12 ſeven Times one under the other; but in *Multiplication* I only ſay 7 Times 12 is 84, which is equal to 12 added 7 Times together.

Sch. I underſtand you very well, Sir; but when one Number is to be multiplied by another, is there any Name given to both or either of them?

Maſt. Yes, the Number that ſtands at Top, or to be multiplied, is called the *Multiplicand*; and the other Number placed below, or what you multiply by, is called the *Multiplier*, and the Product of theſe two is called the Anſwer.

Sch. I underſtand this very well: But how am I to carry the Product of one Number by another readily from Figure to Figure.

Maſt. You muſt learn the following Table perfectly by Heart, at Leiſure, and then you will very readily multiply any Numbers; for *Multiplication* is allowed to be the eaſieſt of all the firſt 4 Rules.

MULTIPLICATION TABLE.

Once 1 is 1

Twice	2	is	4
	3		6
	4		8
	5		10
	6		12
	7		14
	8		16
	9		18

3 Times	3	is	9
	4		12
	5		15
	6		18
	7		21
	8		24
	9		27

4 Times	4	is	16
	5		20
	6		24
	7		28
	8		32
	9		36

5 Times	5	is	25
	6		30
	7		35
	8		40
	9		45

6 Times	6	is	36
	7		42
	8		48
	9		54

A TABLE *of* TWELVES.

7 Times	7	49	12 Times	1	12
	8 is	56		2	24
	9	63		3	36
				4	48
8 Times	8 is	64		5	60
	9	72		6 is	72
				7	84
9 Times	9—is	—81		8	96
10 Times	10—is	—100		9	108
11 Times	11—is	—121		10	120
	12—is	—132		11	132
12 Times	12—is	—144		12	144

Note 1.

When you multiply, you carry one for every Ten to the next Figure, from the Unit's Place to Tens, Hundreds, *&c.* as you did in *Addition* of whole Numbers.

EXAMPLES.

Multiplicands	6	9	6	9
Multipliers	3	5	4	8
Products or Anſwers	18			

Multiply	24	47	56	87
By	3	by 5	by 7	by 6

Multiply	42716	57629	4072156
By	4	by 5	by 7
	170864		

Multiply

Multiply 4276583, by 9. *Anſ.* 38489247.
Multiply 49007567, by 10. *Anſ.* 490075670.

N. B. When you multiply by 10, or by 100, or by 1000, you may ſet down the very ſame Figures as are in the Multiplicand, only adding as many Cyphers to it beſides, as there are Cyphers in the Multiplier. Thus, if the laſt Example were multiplied by 100, then the Anſwer would have 1 Cypher more, *viz.* 4900756700; if it were multiplied by 1000, it would be 4900756700.

Multiply 5716929 by 11. *Anſ.* 62886219.
Multiply 45900765 by 12. *Anſ.* 550809180.
Multiply 947098998 by 12. *Anſ.* 11365187976.

Of double Figures, &c.

Multiply 24*	187	476	and 1364
By 15	by 43	by 67	by 85
120			
24			
Anſ. 360			

Note 2.

* Here in the Firſt of theſe Examples, I firſt multiply 24 by 5 only, and the Product is 120; then I multiply 24 by 1, and ſet the 4 one Figure or Place backward; that is under the 2, and the 2 I ſet one Place, *viz.* under the 1; I then add theſe two Operations together, according to the Laws or Rules of Addition, and find the Sum 360: therefore I ſay, 24 multiplied by 15 produces 360.

More Examples.

Multiply 49267 by 73. *Anſ.* 3596291.
Multiply 952470 by 89. *Anſ.* 84769830.
Multiply 929609 by 987. *Anſ.* 917524083.

Note 3.

When there are 3, 4, 5, or more Figures in the Multiplier, you are ſtill to begin with the 1ſt Figure as before;

then multiply by the 2d Figure of the Multiplier, and ſet down the firſt Figure one Place more to the left Hand, *viz.* under the Tens of the Multiplicand, and have finiſhed the ſecond Line or Row; then proceed to multiply by the 3d Figure, and place the 1ſt Figure of this ſtill one Place more to the left—Thus do with the 4th Figure, ſetting it one Place ſtill further to the left, *viz.* in the Place of Thouſands; and thus proceed, placing the firſt Product of every Figure one Place more towards the left Hand till you have done all the Figures in the Multiplier—Then add all theſe together as in common Addition.—See the firſt of the following Examples.

EXAMPLES.

Multiply	3491706	87142964
By	2453	8395
	10475118	
	17458530	
	13966824	
	6983412	
Anſ.	8565154818	Anſ. 731565182780

4. *To prove* Multiplication.

* Firſt caſt up all the Nines (9's) out of the Multiplicand; that is, add all the Figures together (except the 9's) ſaying 3 and 4 is 7, and 1 is 8, and 7 is 15, and 6 is 21: then ſay, how many 9's in 21—*Anſwer* 2 9's and 3 over—Set this 3 on the left Hand Side of the Croſs. 2dly. Then caſt the 9's out of the Multiplier, ſaying 2 and 4 is 6, and 5 is 11 and 3 is 14; this is one 9 and 5 over—Set this 5 on the right Hand of the Croſs.—3dly. Multiplying theſe 2 together, *viz.* 3 times 5, which is 15; this is one 9 and 6 over, which place at the Top.—Laſtly, caſt the 9's out of the Product or Anſwer, and you will find that it contains five 9's and 6 over, ſet this 6 below the Croſs under the other 6; thus I conclude the Work is right, becauſe the Top Figure in the Croſs is a 6, and the Bottom one

one is alſo 6; for you muſt note the top and bottom Figures muſt be both alike, otherwiſe the Work is wrong.

N. B. This is not an infallible Way to prove the Work, for it will prove right oftentimes when it is wrong; but it will never prove wrong when the Work is right—Diviſion then is the true Way to prove *Multiplication*.

5. *Queſtions for Exerciſe.*

1. Multiply 57325, by 6473. *Anſ.* 371064725.
2. Multiply 3079624, by 7356. *Anſ.* 22653714144.
3. Multiply 4972098, by 59876. *Anſ.* 297709339848.
4. Multiply 69417659, by 36947. *Anſ.* 2564774247073.
5. Multiply 987654321, by 123456789.
   Anſ. 121932631112635269.
6. Multiply 999999999, by 9999999999.
   Anſ. 9999999980000000001.

6. *Of Cyphers in the Multiplier, commonly called Compendiums.*

Rule. When there are Cyphers at the End, or in the middle of your Multiplier, then bring down thoſe Cyphers at the End, that is, ſet an equal Number of Cyphers under them; then multiply by the firſt Figure of the *Multiplier*, and ſet it in one Place farther to the left Hand, in the ſame Line of the Cyphers you took down; then if the next be a Cypher or Cyphers in the Multiplier, bring them down as before, ſetting the firſt ſtill one Place more to the left Hand from the firſt Product of the laſt Figure; then if the next be a Figure, multiply by that, and ſet the firſt Figure of its Product ſtill one Place farther than the Cypher or Cyphers you brought down, and thus proceed carefully, you'll have your Deſire.

Sch. But I wiſh, Sir, you would give me one Example at large?

Maſt. I will.

Multiply	472196071	6241960756
	2908007000	108090400
8	3305372497000	
1 X 8	377756856800	
	42497646390	
	944392142	
8		
	1373149479840497000	674696034900342400

7. *Exerciſes in Compendiums.*

1. Multiply 634745, by 830005. *Anſ.* 526841523725.
2. Multiply 50072900, by 37000070.
Anſ. 1852700805103000.

8. *Of Queſtions in* Multiplication *or Contractions of the* Rule *of* Three.

*** This Rule, well applied and well attended to, is the beſt practical Syſtem to caſt up or tell the Price of any Commodity, at any Price per Yard, Pound, Hundred Weight, Gallon, &c. It is ſo ſimple in itſelf, that for a conſtant Practice of 14 Years in my own public Teaching, I ſeldom met with a Boy ſo dull but he ſoon comprehended the Nature of the Rule itſelf, the Manner how to work it, and his Readineſs in a ſhort Time to perform it.—And therefore I would beg leave to perſuade all Maſters to teach their Scholars this ſhort and eaſy Method of caſting up various Commodities till they are quite perfect.

Sch. What do you mean by Queſtions of Multiplication?

Maſt. Queſtions performed by *Multiplication* only, in Order to ſave the Trouble of the *Rule of Three*, or *Practice*.

Sch. How is this performed?

Maſt. The very ſame as in common *Multiplication*, only having due Regard to the Places of Pounds, Shillings, Pence and Farthings.

EXAMPLES

EXAMPLES.

		s.	*d.*	
1. What coſt 4 Yards, at		3	2	per Yard?
			4	
	Anſ.	12	8	

2. What coſt 7 Gallons, at		2	4	per Gallon?
			7	
	Anſ.	16	4	

3. What coſt 9 Ells, at		8	$6\frac{1}{2}$	per Ell?
			9	
	Anſ. *l.*	3	16	$10\frac{1}{2}$

Here you ſee in theſe three Examples, that I only multiply the Price of the Commodity or Thing ſold or bought by the Number, and carry as in *Addition* of Money.

EXAMPLES *for Trial.*

4. What coſt 7 Ells, at 4*s.* 7*d.*$\frac{1}{2}$ per Ell?
Anſ. 1*l.* 12*s.* 4*d.*$\frac{1}{2}$
5. What coſt 9 Buſhels, at 4*s.* 7*d.*$\frac{1}{4}$ per Buſhel?
Anſ. 2*l.* 1*s.* 5*d.*$\frac{1}{4}$.
6. What coſt 10 Pigs, at 11*s.* 6*d.*$\frac{1}{2}$ each?
Anſ. 5*l.* 15*s.* 5*d.*
7. What coſt 11 Sheep, at 1*l.* 10*s.* 9*d.* each?
Anſ. 16*l.* 18*s.* 3*d.*
8. What coſt 12 Calves, at 3*l.* 7*s.* 6d. each?
Anſ. 40*l.* 10*s.*

Sch. I do: But ſuppoſe the Number ſhould be above 12, *how ſhall I proceed then?*

Maſt. You muſt divide the Number into two ſuch Parts, which, when multiplied together, will make the

whole Number; thus ſuppoſe the Numbers were 24, 32, or 35—I ſay 6 times 4 is 24, or 4 times 6 make 24, ſo I multiply by 4 firſt, then I multiply the Product of that 4 by 6 and that makes 24, or the Anſwer: So alſo for 32, I multiply by 4, and then by 8; for 35, I multiply firſt by 7, and then the Product by 5, for 5 times 7 is 35, and for 54 by 6, and then again by 9, *&c.* An Example or two will make it plain.

EXAMPLES.

9. What coſt 15 Yards, at 3 *s.* 9 *d.* per Yard?
3 times 5 is 15 multiply by 3

11 3 Price of 3
then by 5 5

Anſ. £. 2 16 3 Price of 15

10. What coſt 24 Ells, at 7 *s.* 9½ *d.* per Ell?
4 times 6 is 24 multiply by 4

£. 1 11 2 Price of 4
then by 6 6

Anſ. £. 9 7 – Price of 24

11. What coſt 35 Loads, at £. 1 5 6½ per Load?
5 times 7 is 35 multiply by 5

£. 6 7 8½ Price of 5
7 7

Anſ. £. 44 13 11½ Price of 35

Thus you ſee the Work is done at two Operations, and in the ſame Manner you are to proceed with other Numbers in the following Examples.

EXAMPLES

EXAMPLES *for Exerciſe.*

12. What coſt 42 Gallons, at 4*s.* 9*d.*½ Per Gallon ?
Anſ. 9*l.* 19*s.* 6*d.*
13. What coſt 56*lb.* at 13*s.* 9*d.* per lb ? *Anſ.* 38*l.* 10*s.*
14. What coſt 63 Buſhels, at 9*s.* 3*d.* per Buſhel ?
Anſ. 29*l.* 2*s.* 9*d.*
15. What coſt 72 Chaldron, at 1*l.* 7*s.* 6*d.* per Chaldron ?
Anſ. 99*l.*
16. What coſt 84 Dozen. at 6*s.* 9*d.*¾ per Dozen ?
Anſ. 28*l.* 12*s.* 3*d.*
17. What coſt 96 Groſs, at 11*s.* 4*d.*½ per Groſs ?
Anſ. 54*l.* 12*s.*
18. What coſt 100 Gallons, at 14*s.* 10*d.* per Gallon ?
Anſ. 74*l.* 3*s.* 4*d.*
19. What coſt 108 Butts, at 3*l.* 15*s.* per Butt ?
Anſ. 405*l.*
20. What coſt 121 Pipes, at 10*l.* 17*s.* per Pipe ?
Anſ. 1312*l.* 17*s.*
21. What coſt 132 Loads, at 5*l.* 10*s.* 9*d.* per Load ?
Anſ. 730*l.* 19*s.*
22. What coſt 144 Bullocks, at 14*l.* 15*s.* each ?
Anſ. 2124*l.*

☞ Look into your *Multiplication* Table, and you will ſoon find two Numbers that will make any of theſe ; as in Example 12 it is 42 ; therefore, I multiply by 6, and then by 7 ; and for 56, by 7 and by 8, and ſo for the Reſt.

Sch. I underſtand you, Sir, but ſuppoſe the Number ſhould be ſuch as cannot be made up by any 2 Figures, what muſt be done then ?

Maſt. Take any two Numbers that will come the neareſt to the Number (but not to exceed it) and then add the odd Number or Numbers to it. Thus, ſuppoſe it was required to tell what 43 Gallons come to at 4*s.* 9*d.*½ per Gallon ; I multiply by 6 and by 7, and find that makes 42, which comes to 9*l.* 19*s.* 6*d.* (as in Example 12) then for the odd one to make it 43, I add 4*s.* 9*d.*½ to the aforeſaid Sum of 9*l.* 19*s.* 6*d.* and it makes 10*l.* 4*s.* 3½, the Anſwer for 43 Gallons : So alſo, ſuppoſe the Number was 58, I ſay 7 times 8 is 56, which I perform firſt, and then I add the Price of the two odd Numbers to make 58—

Thus

Thus 58 Weeks Work, at 7*s*. 9*d*. per Week, you will find to be 22*l*. 9*s*. 6*d*.

Sch. I underſtand you now very well.

Maſt. Then we will proceed to *Diviſion*

SECT. VI.

Of DIVISION.

Sch. *WHAT do you mean by* Diviſion?

Maſt. The dividing of any Number into any Parts required.

Sch. Pleaſe to tell me what it teaches more particularly?

Maſt. *Diviſion* teaches us to divide one Number by another, in order to tell how many Times the leſs Number is contained in the greater.

Sch. What are the Names of the different Parts in Diviſion, *or what does it contain?*

Maſt. *Diviſion* contains, or is comprehended under four Parts, *viz.*

1ſt. The *Dividend*, which is the Sum or Number given to be divided.

2dly. The *Diviſor*, or the Sum or Number which you divide by.

3dly. The *Quotient* or *Anſwer*, which always ſhews into how many Parts the *Dividend* is divided; or how many Times the *Diviſor* is contained in the *Dividend*.

4thly. The *Remainder* which is always a fractional Part, and belongs alſo to the *Quotient* which will be more fully ſhewn and better underſtood hereafter.

EXAMPLES.

Ex. 1.	Ex. 2.	Ex. 3.
Dividend	Dividend	Dividend
Diviſor 3)15	Diviſor 6)24	Diviſor 9)63
Quotient or Anſ. 5	Anſ. 4	Anſ. 7
3	6	9
Proof 15	Proof 24	Proof 63

Here

Here I ſay the 3's in 15 are 5 times; the 6's in 24 are 4 times, and the 9's in 63 are 7 times: And to prove it, I multiply the Quotient or Anſwer by the ſame Diviſor, and the Product will be the ſame as the Dividend.

Sch. I ſee the Manner of it, but I wiſh you would give me an Example with more Figures.

Maſt. I will.

	Dividend		Dividend
	By 7)1342945		By 9)43625641
Anſ.	191849-2	Anſ.	4847293-4
	7		9
Proof	1342945	Proof	43625641

Here I ſay the 7's in 1 I can't have; therefore I take 2 Figures, ſaying the 7's in 13 is 1, and 6 remains over, this 6 I carry to the 4 and placing it in my Mind before it, it makes 64; then I ſay how many 7's can I have in 64, Anſwer 9 7's, and 1 remains over, which I carry to or place before the next Figure 2, and it is 12, then the 7's in 12 is 1 and 5 over, which I carry to the 9, and it makes 59; then I ſay the 7's in 59 is 8 times and 3 over, which I carry to the 4 and it makes 34, now the 7's in 34 is 4 times and 6 over, which 6 I carry to the laſt Figure 5 and it makes 65; then I ſay the 7's in 65 is 9 times and 2 over, which 2, (as there are no more Figures in the Dividend) I place after the Anſwer thus -2: So that the Quotient or Anſwer will be 191849-2,

To prove the Work.

I multiply the Anſwer 191849-2 by the Diviſor 7, and take in the Remainder 2, thus 7 times 9 is 63, and 2 the Remainder is 65, 5 and I carry 6; then 7 times 4 is 28, and 6 is 34, 4 and I carry 3, &c.

MORE EXAMPLES.

Dividend	Dividend	Dividend
By 9)4194064	By 11)410478	By 12)94307164
Anſ. 466007–1	Anſ. 38225–3	Anſ. 7858930–4
8)47006492	12)7149653	12)91842605
12)609932176457	12)987621907056	

I deſire you, my Scholar, to make yourſelf quite perfect in dividing by ſingle Figures; but more particularly by 12's in 1 Line as in the above Example, for though it is troubleſome at firſt, yet Induſtry and Reſolution will ſoon conquer it, and then you be prepared to divide by more Figures with great Eaſe.

Sch. I will take Care, Sir, to be perfect in what you have ſaid, and I don't doubt but I ſhall ſoon overcome it; but I am afraid of long Diviſion, *becauſe I have heard ſay, that it is much the difficult Rule of the Four.*

Maſt. Pray be eaſy, you will ſoon underſtand *this* as well as the former.

Ex. 1.			Ex. 2.	
Divide	Quotient or Anſ.		Dividend	
By 34)47394	(1393-32 over		427)1467469	(3436 Anſ.
34	34		1281*	
133	5574		1864	
102	4182		1708*	
319	47394	Proof	1566	
306			1281*	
134			2859	
102			2562*	
32 remains			297* remains	

Proof by *Addition* 1467469

An Explanation of Ex. 1. *at large.*

I aſk how many Times 34 is contained in 47 and find 1, which I put in the Quotient; then I multiply 34 by 1, and ſet 34 under 47; then I ſubtract 34 out of 47, there remains 13, then I bring down the next Figure (viz. 3) and ſet it after the 13, and it is 133, then I aſk how many times 34 I can have in 133, and find it 3 times, which I place in the Quotient alſo, and then I multiply the Diviſor 34 by 3, which is 102, and place it under 133, and ſubtract it therefrom, and find the Remainder 32, to this I bring down the next Dividend Figure (viz 19) and it is 319; then I aſk how many Times 34 I can have in 319, and find it 9 times, which I now place after the 3 in the Quotient, and then multiply 34 by 9, I find it 306, which I place under 319, and ſubtract it therefrom, the Remainder is 13, to which I bring down the laſt Dividend Figures, *viz*, 4 and it is 134; then I enquire how many times 34 the Diviſor is contained in 234, and find it 3 times, which I alſo place in the Quotient after the 9; then I multiply 34 the Diviſor by 3, and it is 102, which I ſubtract from 134, and there remains 32 at laſt—— Thus I find that 47394 divided by 34, produces in the Quotient or for Anſwer 1393 and 32 over, which in Fractions is thus

thus expreſſed as you will ſee hereafter. Anſwer 1393 $\frac{32}{34}$ Proceed in the ſame Manner, for Example the ſecond or any other ſuch like Sums.

To prove Diviſion.

Note 1. *By* Multiplication.

Multiply the Diviſor by the Quotient or Anſwer, or the Quotient by the Diviſor, and take in the Remainder, and if this Product or Sum be equal to the Dividend the Work is right, otherwiſe falſe, as in Example 1ſt,

Note 2. *To prove it by* Addition.

Add the Remainders of the whole Operation together in Order as they ſtand, and if the Sum be equal to the Dividend the Work is right: Thus in Example 2d, I add all the Remainders together mark'd with Stars (*) and find the Sum 1467469, which is right.

I confeſs I approve of this Method, becauſe it is not only ſhorter and eaſier, but it learns the Scholar to ſet his Figures under each other in due Order, which is not often done by Learners, but here they are bound to do it, otherwiſe they cannot prove it eaſily. Now *Tyro*, try any of the following Queſtions, and draw your Lines ſtrait, and then the Work will ſtand ſo that you may prove it with great Eaſe, provided you have done the Operation right.

Tyro, Sir, I will try at them directly.

MORE EXAMPLES.

Divide 20010490 68, by 7638. *Anſ.* 261986.
Divide 35640569003, by 43859. *Anſ.* 812617.
Divide 14771653740, by 246145. *Anſ.* 60012.

Sch. I perceive, Sir, that theſe Examples come out free from any Remainder; but ſuppoſe there ſhould be Remainders, how am I to know their Value?

Maſt. You muſt then ſet the Remainder after the Quotient or Anſwer, and place the Diviſor under it. Thus ſuppoſe I divide 57 by 8, it will be 7 and 1 over, *viz.* $7\frac{1}{8}$, that is, 7 and 1 eighth Part.—but to demonſtrate it plainer to you; let us ſuppoſe 57*l.* to be divided among 8 Men, then it is evident that the Share of each is 7*l.* (which is 56) and ſtill 1*l.* remains over, which is $\frac{1}{8}$ of a *l.* Now one eighth of a Pound is 2*s.*6*d.* therefore each Man's Share 7*l.* 2*s.* 6*d.* ſee Examples in Money.

Sir, I now underſtand you well.

Maſt.

Maſt. Then I am ſatisfied, and from this Inſtance you will naturally conclude every Remainder is ſuch a Part of the Anſwer as it expreſſes in Proportion. Thus

Divide 1246039592 by 4629 *Anſ.* $269181\frac{743}{4629}$.

Divide 8255511930 by 8716. *Anſ.* $947167\frac{4358}{8716}$, which $\frac{4358}{8716}$ is equal to $\frac{1}{2}$, becauſe 4358 is juſt the half of the Diviſor 8716.

EXAMPLES *without Anſwers.*

Divide 97464597 by 675. *Anſ.*

Divide 19076476 by 4762. *Anſ.*

Divide 79070674976 by 40079. *Anſ.*

Of Cyphers or Compendiums.

Rule. Cut off as many Cyphers as you find in the Diviſor, and cut off the ſame Number of Cyphers or Figures in the Dividend, as you did Cyphers in the Diviſor, and divide by the whole Numbers as before.

EXAMPLE.

Divide 9840000 by 10000. Here I cut off the 4 Cyphers in the *Diviſor*, thus 1|0000, and alſo the 4 Cyphers in the *Dividend* thus, 984|0000, and then I have only to divide by 1; therefore the Anſwer will be the ſame as the Dividend, *viz.* 984 *Anſ.* So alſo if I divide 4764|500 by 9|000. *Anſ.* $529\frac{3500}{9000}$.

Divide 4218976000 by 9150000.

Anſ. $461\frac{826|000}{9150|000}$ or $\frac{826}{9150}$.

Divide 94007 1629500 by 57167000. *Anſ.*

Of Diviſion of Money.

Sch. How is this performed?

Maſt. The ſame as common *Diviſion*, only having due Regard to the Place of *Pounds*, *Shillings*, *Pence* and *Farthings*, an Example or two will ſoon make it eaſy.

Divide 4)4*l.* 12*s.* 8*d.* into 4 Parts.

1*l.* 3*s* 2*d* Anſ.

Divide 8)17*l.* 16*s.* 6*d.* into 8 Parts.

2*l.* 4*s.* 6*d.*$\frac{3}{4}$ Anſ.

In Example 1ſt. I only ſay the 4th Part of 4*l.* is 1*l.* the 4th of 12*s.* is 3*s.* and the 4th Part of 8*d.* is 2*d.* In Example 2d. I ſay the eights or 8th Part of 17*l.* is 2*l.* and 1*l.* over, which I carry to the *Shillings* and it is 1*l.* 16*s* or 36*s.* then the 8's or 8th Part of 36 is 4 times and 4*s.* over, which I carry to the Place of *Pence* and it is 4*s.* 6*d.* ; now the 8th Part of 6*d.* is 3 *Farthings* as above. Pray now look at the Example carefully and you will ſoon underſtand the following.

MORE EXAMPLES.

	l.	*s.*	*d.*
By 6)	47	10	6
Anſ.	7	18	5

	l.	*s.*	*d.*
By 8)	25	14	4
Anſ.	3	4	3$\frac{1}{2}$

	l.	*s.*	*d.*
By 9)	64	18	3
Anſ.	7	4	3

By 7)	53	1	11$\frac{1}{2}$

By 9)	27	10	10$\frac{1}{2}$

By 12)	173	15	3

Queſtions for Exerciſe.

1. A Gentleman dying, left to 5 poor Widows of his Pariſh 282*l.* 17*s.* 11*d.* to have equal Share alike, I demand what each Widow had. *Anſwer.* 56*l.* 11*s.* 7*d.* each.

2. A

2. A Butcher bought 84 Sheep, which coſt him 65*l.* 9*s.* I demand what they coſt him a-piece, or what each coſt? *Anſwer.* 15*s.* 7*d.*

Divide by 12 and then by 7, for 12 times 7 is 84.

3. A Gentleman gave 13*l.* 19*s.* 2*d.* to be divided equally among 100 School-Boys, who had particularly minded their Learning, and were very good at Home and at School. I demand how much each Boy had? *Anſwer.* 2*s.* 9$d\frac{1}{2}$ each.

Divide by 10 and by 10.

SECT. VII.

Of REDUCTION.

Sch. *WHAT do you mean by* Reduction, *and what does it principally teach?*

Maſt. *Reduction* ſignifies the Art of reducing or turning Things from one Name or Denomination into another; as Pounds into Shillings, Pence into Crowns, Yards into Ells, *&c.*

Sch. This is very uſeful, and what more, pray?

Maſt. *Reduction* contains 2 Parts, or Names, *aſcending* and *deſcending*.

1. *Reduction aſcending* teaches to reduce or bring Things of ſmaller Denomination into greater; as Farthings into Pence, Shillings, or Pounds; Ounces into Pounds, or hundred Weights; Inches into Miles, *&c.*

2. *Reduction deſcending* teaches to reduce greater Things into ſmaller; as Pounds into Shillings, Pence and Farthings; hundred Weights into Pounds and Ounces; Miles into Yards, Inches, *&c.* This laſt is rather the more eaſy and natural of the two, therefore I ſhall ſpeak of this firſt.

N. B. *Reduction aſcending* is always performed by Diviſion, and *Reduction deſcending* is performed by Multiplication.

Of REDUCTION DESCENDING.

RULE.

Always multiply by as many as the leſs Denomination is contained in the greater, and you have the Anſwers.

EXAMPLES.

1. In 25 *l.* how many Shillings?

20*

Shill. 500 Anſwer.

2. In 27 *s.* how many Pence?

12*

Anſw. 324 Pence.

* Here 20 Shillings make a Pound Sterling, and 12 Pence a Shilling therefore I multiply by theſe.

3. In 175 *l.* 17 *s.* 6 *d.* ½ how many Shillings, Pence and Farthings?

	L.	*s.*	*d.*
**	175	17	6 ½.
	20		
	3517	Shill.	
	12		
	42210	Pence.	
	4		
	168842	Farthings.	

	L.	*s.*	*d.*
Again,	409	15	9 ¼
	20		
	8195	Shill.	
	12		
	98349	Pence	
	4		
	393399	Farthings.	

Note. Remember always to take in the odd Shillings, Pence and Farthings. Thus, I take in 17 Shillings when I multiply by 20; the 6 Pence when I multiply by 12; and the Halfpenny when I multiply by 4.

GENERAL EXAMPLES *for Exerciſe.*

Note. I ſhall not ſet down the Anſwers to the following Queſtions, as it cauſes a Supineneſs in the Learner, and in ſome Caſes may rather hurt

hurt than do him good: But I here rather chuſe to ſet down what he is to multiply by, and that will not only enable, but encourage him to proſecute the Sums.— The Reaſon why he is to multiply by ſuch and ſuch Figures can be no Trouble for any Maſter to tell him, and he will eaſily underſtand the Reaſon, though perhaps he could not of himſelf find out what was proper to multiply by.

4. In 45 Guineas, how many Shillings and Groats?— *Rule*, Multiply by 21, and by 3.

5. In 27 Moidores and 11 Shillings, how many Shillings, Sixpences and Pence?— Multiply by 27, and take in the 11 Shillings, then by 2 for the Sixpences, and by 6 for the Pence.

6. In 120 Portugal Pieces of 36 Shillings each, how many Shillings and Halfpence? — Multiply by 36, and then by 24.

AVOIRDUPOIS WEIGHT.

7. In 17 lb. 14 oz. 11 dr. how many Ounces and Drams? — Multiply by 16, and take in the 14; then multiply by 16, and take in the 11.

8. In 14 C 3 qrs. 17 lb. how many Quarters, Pounds and Ounces? — Multiply by 4, and take in the 3 Quarters; then by 28, and take in the odd 17 lb. and then at laſt by 16, you will have the Ounces.

TROY WEIGHT.

9. In 3 lb. 5 oz. 11 dwts. 17 grs. how many Ounces, Pennyweights and Grains? — Multiply by 12, by 20, and by 24, taking in the odd 5 oz. 11 dwts. 17 grs.

DRY MEASURE.

10. In 47 Loads, 14 Buſhels, how many Buſhels and Pecks? — Multiply by 40, and take in 14, you have the Buſhels, and then by 4 you have the Pecks.

LIQUID MEASURE.

11. In 14 Butts, 2 Barrels, how many Barrels and Gallons? — Multiply by 3, and take in 2, you have the Barrels, then by 36, and you have the Gallons.

CLOTH MEASURE.

12. In 47 Yards, 2 Quarters, how many Quarters and Nails? — Multiply by 4, for Quarters, and again by 4, for the Nails.

13. In 34 Ells Engliſh, how many Quarters and Nails? — Multiply by 5, and then by 4; or by 4, and then by 5.

LONG MEASURE.

14. In 47 Miles, 4 Furlongs, 27 Rods, how many Furlongs and Rods? — Multiply by 8, and then by 40.

15. In 417 Yards, 2 Feet, 2 Inches, how many Feet, Inches and Barley Corns? — Multiply by 3, by 12, and by 3.

TIME.

16. In 24 Days, 17 Hours, 45 Minutes, 35 Seconds, how many Hours, Minutes and Seconds? — Multiply by 24, by 60, and by 60.

2. REDUCTION ASCENDING.

Scho. I underſtand what you have ſaid very well; pray give me ſome Examples in this Rule, and how I am to proceed.

Maſt. I will — You are then to proceed juſt the Reverſe of the laſt Rule, and divide by the ſame Numbers in the ſame Caſes, as you before multiplied by.

EXAMPLES.

1. In 5407 Shillings how many Pounds Sterling? — Divide by 20, you will find the Anſwer 270*l.* 7*s.*

2. In 6472 Pence how many Shillings and Pounds Sterling? — Divide by 12, and then by 20, you will have 26*l.* 19*s.* 4*d.*

3. In 4075326 Farthings how many Pence, Shillings and Pounds Sterling? — Divide by 4, by 12, and then by 20, you will have at laſt 4245*l.* 2*s.* 7*d.* $\frac{1}{2}$.

4. In 144000 Farthings, how many Pence, Threepences, half Crowns, Crowns and Pounds?

Anſ. 36000 Pence, 12000 Threepences, 1200 half Crowns, 600 Crowns and 150*l.* Sterling.

This

This is ſufficient for any other Example.

N. B. Remember that whatever remains, after Diviſion, has the ſame Name as the Dividend.

5. In 407651 Farthings how many Twopences, Fourpences, Shillings and Guineas? —— Divide by 8, by 2, by 3, and by 21.

AVOIRDUPOIS WEIGHT.

6. In 47645 Ounces how many Pounds, Quarters and hundred Weights? —— Divide by 16, by 28, and by 4.

TROY WEIGHT.

7. In 471602 Grains how many Pennyweights, Ounces and Pounds Troy? —— Divide by 24, by 20, and by 12.

DRY MEASURE.

8. In 146219 Pints how many Quarts, Gallons, Firkins, Kilderkins, Barrels and Butts? —— Divide by 2, by 4, by 9, by 2, and by 3.

DRY MEASURE.

9. In 30721 Pints how many Pecks, Buſhels, Quarters and Loads? —— Divide by 16, by 4, by 5, and by 8.

CLOTH MEASURE.

10. In 941 Nails how many Quarters and Yards? —— Divide by 4, and by 4.

LONG MEASURE.

11. In 471635 Inches how many Feet and Yards? —— Divide by 12, and by 3.

LAND MEASURE.

12. In 4760 Rods, how many Acres? —— Divide by 160, you have Acres, and the Remainder will be Rods, which divide by 40, you will have the Roods, *viz.* 29 Acres, 3 Roods,

TIME.

TIME.

13. In 47620 Minutes how many Hours, Days and Weeks? —— Divide by 60 for Hours, by 24 for Days, and by 7 for the Weeks.

PRACTICAL QUESTIONS.

14. In 34675 Farthings how many Pence, Threepences, Sixpences, Shillings and Crowns? —— Divide by 4, by 3, by 2, by 2 again, and then by 5.

15. In 40729 Halfpence how many Groats, Shillings, Crowns and Pounds?

Sch. I thank you, Sir, for theſe Examples; but more particularly as you have told me what to multiply and divide by, which will both guide me in the Path I am walking in, and encourage me in the Journey I am purſuing.

Maſt. You give me great Satisfaction in expreſſing yourſelf in this Manner: If Scholars in general were ſo ready and deſirous to attain to the Knowledge of Learning, how happy would it be? It would anſwer the very Deſign of their being ſent to School; would give their Tutors great Pleaſure from the Credit of their Improvement, and would naturally redound and turn to their own more particular Advantage in the End. —— Well, my dear Pupil, ſince you promiſe ſo fair, I will not be backward of ſhewing you every Thing that is neceſſary.

3. REDUCTION ASCENDING *and* DESCENDING, *being proper* EXERCISES *both for* Inſtruction *and* Practice.

Sch. I hope, Sir, you will give me an Example or two at large.

Maſt. I will do any Thing, as I ſaid before, to ſet you forward; but you muſt on your Part be very diligent to remember what to multiply and divide by, as I have taken (you know) great Pains to remind you of it continually: I will give you two Examples with their Proofs.

EXAMPLES.

EXAMPLES.

1. In 27 *l.* 14 *s.* 9 *d.*$\frac{3}{4}$ how many Shillings, Pence and Farthings, and the Contrary? that is, the Proof back again?

l.	*s.*	*d.*	
27	14	9$\frac{3}{4}$	
20			
554			Shillings
12			
6657			Pence
4			
4)26631			Farthings
12) 6657		-3	qrs.
2|0) 55	|4	-9	d.
** 27	-14	-9$\frac{3}{4}$	Proof

In 125 *l.* 15 *s.* how many Shillings, Groats, Pence and Half Pence.

l.	*s.*	*d.*	
125	15		
20			
2515			Shillings
3			
7545			Groats
4			
30180			
2			
** 2)60360			Half Pence
4)30180			Pence
3) 7545			Groats
2|0)251	|5		Shillings
125	-15		Proof

N. B. You ſee in the Proof of theſe Examples, that I divide every Product back again by the ſame Figures I multiplied by, and if every Quotient anſwers to its foregoing Product, you may depend the Work is right, otherwiſe falſe.

Sch. I ſee plainly the Manner of working theſe Queſtions; but how am I to reduce foreign Money into Pounds Sterling, becauſe I am unacquainted with foreign Coins?

Maſt. The following Table then will be of Service to you.

A TABLE

A TABLE *of* FOREIGN COINS.

Name.	*What Country.*	*The Value.* l.	s.	d.
Abaſhee	A *Perſian* Coin —		1	4
Beſſe	*Ditto* ——			¾
Cohan	of *Japan* ——	1	10	
Cruſado	*Germany* ——		6	2
Ditto	*Portugal* ——		2	10
Crown	*French* ——		4	6
Ditto	of *Florence* ——		5	3
Ditto	of *Rome* ——		7	6
Dina	of *Aleppo* ——	1	10	0
A Dollar	*Italy* or *Spain* ——		4	6
A Lion Dollar	*Aleppo* ——		4	
A Croſs Dollar	*Holland* ——		4	2
A Specie Dollar	*Ditto* ——		5	
A *Zeland* Dollar	*Ditto* ——		3	
Leopold's Dollar	*Ditto* ——		4	3
Dollar, Prince of Orange	*Ditto* ——		4	4
Dollar	of *Dantzick* or *Sweden*		2	3
Rix-Dollar	*Germany Empire* —		4	8
A Ducat	*Hungary* ——		4	8
A Ducat	*Poland* ——		5	3
Ditto	*Naples* ——		5	
A Piece of Eight	*Spaniſh*		4	6
A *Mexico* Piece of Eight			4	4½
Florin			4	4
Palemo Florin			1	3
Florin	*Holland* ——		2	
Harpier	*Iriſh* ——			9
A Livre	*France* —		1	6
A Mark	*England*, not current		13	4
Mill-Ree	*Portugal* ——		6	9
Moidore, 4 Mill-Rees		1	7	
Ruble	*Muſcovy* —		10	
Seraph	*Turkey* —		5	

EXAMPLES.

3. In 347 *l.* 15 *s.* how many Shillings, Crowns, Pence, and ½ Crowns?

Anſ. 6955 Shillings, 1391 Crowns, 2782 half Crowns, and 83460 Pence.

4. In

4. In 47163 Groats, how many Pence, 6 Pences, $\frac{1}{2}$ Crowns and Pounds?

Anſ. 188652 Pence, 31442 ſix Pences, 6288 $\frac{1}{2}$ Crowns, and 12 Pence over, and 786*l.* 1*s.*

5. In 4760 French Crowns, at 4*s.* 6*d.* each. how many Livres, Pence, Shillings and Guineas?

Anſ. 14280 Livres, 257040 Pence, 21420 Shillings and 1020 Guineas.

6. In 100*l.* how many Guineas, Crowns and 3 Pences?

Anſ. 95 Guineas and 5 Shillings over, 400 Crowns, and 8000 3 Pences.

7. How many Guineas, Pounds, Shillings and Crowns are there in 140 *Portugal* Pieces?

Anſ. 240 Guineas, 252 Pounds, 1008 Crowns, and 5040 Shillings?

8. In 4916 Ducats of *Poland*, at 5*s.* 3*d.* each, how many Rix-Dollars of the Empire, at 4*s.* 8*d.* each?

Anſ. 5530$\frac{1}{7}$ or 5530 and 2*s* 4*d.* over.

9. In 47640 *Palemo* Florins, at 15*d.* each, how many Crowns, Shillings, Pounds and *Portugal* Pieces?

Anſ. 11910 Crowns, 59550 Shillings, 2977*l.* 10*s.* and 1654 *Portugal* Pieces, and 6*s.* over.

10. A Merchant in *London* ſends his Correſpondent in *Holland* as much Tobacco as comes to 1201*l.* 5*s.* and is to receive the ſame in Croſs Dollars, at 4*s* 2*d.* each, how many muſt he receive?

Anſ. 5766.

11. In 6492 Ports, how many Moidores?

Anſ. 8656.

12. In 8656 Moidores, how many Ports?

Anſ. 6492.

Note. In all ſuch Queſtions as theſe, after the Learner has multiplied by 36, and divided by 27, according to the common Way; let him be told that to multiply by 4, and divide by 3, will anſwer the ſame End (in Queſtion 11) becauſe 27 is $\frac{3}{4}$, or 3 Quarters of 36—And in Queſtion the 12th, he muſt multiply by 3, and divide by 4; becauſe there will be juſt $\frac{1}{4}$ leſs Ports than Moidores; this will lead him into the practical Part of Arithmetic, which is ſo neceſſary in Buſineſs, and the Want of it ſo much complained of in Compting-Houſes, where Diſpatch is required.

13. *In

13. *In 200 Ports, how many Pounds, ½ Crowns, Crowns, Pence and Groats?

Anſ. 360 Pounds, 1440 Crowns, 2880 half Crowns, 86400 Pence and 21600 Groats.

* *Note.* This, and ſuch like Queſtion, may often be done 2 or 3 different Ways; and the Learner ought to be told that he need not follow exactly or the Words or the Queſtion, but the Nature of the Queſtion itſelf.—Thus in Queſtion the 13th, it requires ½ Crowns firſt, and then Crowns; by which Means there will be Occaſion firſt to multiply the Pounds by 8 for ½ Crowns; then to divide by 2 for the Crowns; then to multiply by 60 for the Pence, and to divide by 4 for the Groats—Whereas I would find the Crowns firſt by multiplying the Pounds by 4; then by 2 for the ½ Crowns; then by 30 for the Pence; and divide by 4 for the Groats: Thus have you but one Diviſion, which is much better. This is all I ſhall ſay upon any Thing of this Sort hereafter, as the Hint will be ſufficient for any practical Maſter and diligent Scholar.

14. A rich Man had 6 Villages, every Village 4 Streets, every Street 40 Houſes, every Houſe 6 Rooms, every Room 2 Bureaus, every Bureau 20 Drawers, in every Drawer was 4 Purſes of Gold, each Purſe contained 200 Guineas; I demand how many Pounds, Shillings, Pence and Farthings are in all?

Anſ. 19353600 Pounds, 387072000 Shillings, 4644864000 Pence and 18579456000 Farthings.

15. A Farmer has 6 Folds, in every Fold 20 Sheep, each Sheep has 3 Lambs; The Sheep he ſold for 1*l.* 3*s.* 6*d.* each, I demand how much he made of them?

Anſ. The Value of the Sheep is 141*l.* and the Lambs 189*l.*

16. There were 2000 Men in taking of *Quebec*, and they found in it 87653*l.* 10*s.* The General had for his Share 15000*l.* and 10 principal Officers had each 1000*l.* the Remainder was equally divided among the 1989 common Men. I demand how much each had?

Anſ. Each common Man had 30 Guineas, *viz.* 31*l.* 10*s.* each.

17. A curious old Gentleman had heaped together a great Number of all the *Engliſh* Silver Coins, *viz.* Crowns, ½ Crowns, Shillings, 6 Pences, 4 Pences, 3 Pences, 2 Pences, and Pence, and when he died he left his Grand-Daughter 140*l.* 2*s.* to be paid her in theſe Pieces, and to have of each an equal Number. I demand how many of each ſhe ought to receive?

Anſ. 285 of each.

18. How many Legs, Heads, and Tails have a 11 Dozen Dogs? *Anſ.* 792.

19. A Merchant in *London*, has a Debt due upon his Correſpondent at *Holland*, for 2570*l.* 14*s.* 6*d.* Sterling; and his Correſpondent remitted the Payment, in Duccatoons at 5*s.* 2*d.*$\frac{3}{5}$ each; how many Duccatoons muſt he receive?

Anſ. 9855 *duc.* $\frac{2}{3}\frac{5}{1}\frac{5}{3}$, or 51 Pence over.

20. In 747699 Pence; how many Crowns, Guineas, *Mexico* Pieces of Eight, at 4*s.* 4*d.*$\frac{1}{2}$ each; and *Flemiſh* Pounds at 33*s.* 4*d.*?

Anſ. 12461 Crowns, 39*d.* over; 2967 Guineas, and 15*d.* over; 14241 *Mexico* Pieces, and 93 Half-pence or 3*s.* 10*d.*$\frac{1}{2}$ over; and 1869 *Flemiſh* Pounds, and 99*d.* or 8*s.* 3*d.* over.

AVOIRDUPOIS WEIGHT.

21. In †14*C.* 3*qrs.* 10*lb.* how many Quarters, and Pounds? *Anſ.* 59*qrs.* or 1662 *lb.*

† Note, There are two Methods to reduce Cwts. into lbs; and both better than the common Way: *viz.* ſet the Hundred Weight 4 times under each other in the following Manner, and that is the Pounds; then add the odd Weight in Pounds to it, and all is done.

Cwts. qrs. lb.	
14. 3. 10.	
14	
14	
14	
1568 *lb.* in 14 Cwt.	
94 in 3*qrs.* 10*lb.*	
1662	

Another ſhorter Way; Multiply the Cwts. by 12 and ſet 2 Figures out to the Left Hand; put the odd Weight underneath and add all 3 together; Thus,

Cwts.
14 —Multiply by 12
168
94 odd Pounds
Anſ. 1662 as before

22. Suppoſe I had 319 Ingots of Silver, each weighing 22*lb.* 10*oz.* 19*dwts.* 11*grs.*; how many Dozen of Plates may be made out of this Quantity, ſuppoſe each Plate to weigh 11*oz.* 13*dwts.* 16*grs.*

Anſ. 625 Dozen, and 7 Plates $\frac{4597}{5608}$.

23. In 518 Tuns of Wine, each 126 Gallons; how many Caſks or Pieces, each containing 33$\frac{1}{4}$ Gallons, *viz.* 33 Gallons, 2 Pints.

Anſ. 3925 Pieces, 19 Quarts or 38 Pints, or 4 Gallons 6 Pints over.

24. A Captain of a Ship bought 106 Butts 1 Barrel of Porter, of a Victualler, to carry with him in his Voyage: He is to have the whole delivered in Bottles containing 4 to a Gallon; I demand how many Dozen there were? *Anſ.* 3828.

25. How many Furlongs, Yards and Inches will reach from, or are contained between *London* and *Harwich*, ſuppoſing it to be 60 Miles, 4 Furlongs?

Anſ. 484 Furlongs, 106480 Yards, and 3833280 Inches.

26. How many Furlongs, Yards, Feet, Inches and Barley-corns in Length contained in the Circumference of the Whole Globe, ſuppoſing it to be 25,000 Miles?

Anſ. 200000 Fur. 44000000 Yards, 132000000 Feet, 1584000000 Inches and 47520000000 Barley-corns.

27. Suppoſe I was born in the Year 1715, and the preſent Year 1765; how many Years, Days, Hours, Minutes, and Seconds or Moments am I old, allowing juſt 365 Days to the Year?

Anſ. 50 Years, 18250 Days, 438000 Hours, 26280000 Minutes, and 1576800000 Seconds.

28. How many Days, Hours, Minutes and Seconds are expired ſince the Birth of our Saviour *JESUS CHRIST*; ſuppoſing it 1765 Years, 147 Days, 15 Hours, 45 Minutes and 27 Seconds.

Anſ. 644372 Days, 15464943 Hours, 927896625 Min. and 55673797527 Seconds.

Sch. I thank you for theſe Examples, and you may depend upon my greateſt Care to work them all: but if I remember right, you ſaid in Addition that you would ſhew me ſomething more concerning Square *and* Land-Meaſure, *when you came to this Rule of* Reduction.

Maſt. I did; for in that Place you could not ſo well underſtand it.—And I think before you enter upon it, you ſhould firſt be acquainted with the following Signs or Characters, which are commonly uſed in *Arithmetic*, and will much conduce to, and help you forward in underſtanding ſome other Things in the more Superior Branches of Learning.

Of

Of the SIGNS *or contracted* CHARACTERS *made uſe of in* ARITHMETICK.

Sch. What are theſe Characters or Signs?

Maſt. They are 5 in Number; as follows, *viz.* 1ſt (=) 2nd (+) 3rd (—) 4th (×) 5th (÷).

Sch. What do they Signify?

Maſt. The 1ſt (=) or two Lines drawn even one over the other, is the Sign of *Equality*, and ſhews that the Number or Numbers placed before it, are equal to the Number or Numbers after it: Thus 2 more 4 = 6, is read 2 added to 4 is *equal* to 6. And 12 more 15 = 27, that is, 12 added to 1 will be *equal* to 27.

Sch. I underſtand you well; that this Sign = is read or ſignifies equal to: *Pray explain the Reſt.*

Maſt. I will. This Character (+) is the Sign of *Addition*, and ſignifies *more*; and ſhews that the Numbers between which it is placed are to be added together: Thus, 4 + 5 + 9 = 18 that is, 4, 5 and 9 added together will be equal to 18: ſo 14 + 5 + 12 = 31.

3. This Character (—) is the Sign of *Subſtraction*, and ſignifies *leſs*, and ſhews that the Numbers placed after it is to be taken out of, or ſubſtracted from the Number before it: Thus 27 — 14 ſhews, that 14 is to be taken from 27: And alſo 12 + 4 — 7 = 9 ſhews, that when 7 is ſubſtracted from the Sum of 12 and 4, there will remain 9.

4. This Character (×) is the Sign of *Multiplication* and ſignifies *into*: It ſhews that the Numbers between which it is placed are to be multiplied continually into each other: Thus, 4 × 6 is 4 into, or multiplied by 6. And 8 × 5 × 3 = 120, ſhews that 8 multiplied by 5, and that Product again by 3, the laſt Product will be equal to 120.

5. This Character (÷) is the Sign of *Diviſion*, and ſignifies divided by: it ſhews that the Number or Numbers before it are to be divided by the Number after it: Thus, 36 ÷ 4, ſhews that 36 is to be divided by 4: So alſo 72 ÷ 9 = 8: that is 72 divided by 9 is equal to 8. Again 192 ÷ 12 = 16. Do you underſtand it?

Sch. I do very well.

Maſt. Then I will ſet you a few of them for Practice,

First, 4 + 21 + 19 — 8 = 36.

2nd. 9 + 27 + 40 — 31 × 5 = 225.

3rd. 19 + 142 — 57 × 8 ÷ 16 = 52.

Sch.

Sch. I think I can read any of theſe—However the 1ſt is thus; that after 8 is ſubſtracted from the Sums of 4, 21 and 19, the Remainder is 36; Is this right?

Maſt. Yes; and I make no Doubt, but you know the other two, which will qualify you (at preſent) for any thing of this Sort; and therefore I ſhall forthwith give you ſome Examples in Square, and Land-meaſure.

Of SQUARE-MEASURE.

Maſt. This Rule as I ſaid before is very little underſtood, becauſe ſo ſeldom taught; but it is well known how uſeful it is in many Trades and Artificers, as well alſo as in *Land-meaſure*, and therefore I ſhall give you the *Lineal Table* before the *Square Table*, that you may ſee the Reaſon from whence the Square proceeds, and how it is formed.

Note, Remember that the Square of any Number is only to multiply that Number by itſelf, thus the Square of 4 is 4 × 4 = 16; alſo the Square of 12 is 12 × 12 = 144, as you ſee by the following Tables.

TABLE I.

Of Lineal-meaſure, *or Length only.*

4	Quarters	1 Inch
12	Inches	1 Foot
3	Feet	1 Yard
16½	Feet	1 Rod, or
5½	Yards	1 Rod
40	Rods	1 Fur.
8	Furlongs	1 Mile
320	Furlongs	1 Mile

TABLE II.

Of Square-meaſure, *or Length and Breadth.*

16	Sq. Qrs.	= 4	×	4	=	1 Sq. Inch.
144	In.	= 12	×	12	=	1 Foot.
9	Feet	= 3	×	3	=	Yard.
272¼	Feet	= 16½	×	16½	=	1 Rod.
30¼	Yds	= 5½	×	5½	=	1 Rod.
160	Rds.	= 40	×	40	=	1 Acre.
64	Fur.	= 8	×	8	=	1 Mile.
102400	Rods	= 320	×	320	=	1 Mile.

N. B. Divide the Square Rods by 160, the Square Rods in an Acre of Ground or Land, and the Quotient will be the Square Acres, and the Remainder Rods, which divide by 4 gives the Roods or Quarters: Thus the foregoing Number 102400 Rods in a Mile, divided by 160 the Rods in an Acre, give 640 Square Acres in 1 Mile Square.

EXERCISES *in this Rule.*

1. How many Pieces, each 1 Quarter of an Inch Square, may be cut of a Piece of Board, 15 Inches Square?

Anſ. 3600.

2. How many marble Stones, each 9 Inches Square, will ſ*a* a Room 18 Feet Square? *Anſ.* 576.

3.

3. How many 10 Inch Tiles will floor a Malt-Kiln 16 Feet long and 12 Feet wide?

Anſ. 276 $\frac{48}{100}$ Tiles, or nearly 276 $\frac{1}{2}$.

4. How many Deal Boards, 9 Feet, 4 Inches long, and 9 Inches wide, will floor a Room 18 Feet long, and 15 Feet wide? *Anſ.* $38\frac{576}{8}$ Boards, or better than $38\frac{1}{2}$.

5. How many Acres are contained in a Field 80 Rods long, and 60 Rods wide? *Anſ.* 30 Acres.

Of SOLID MEASURE.

Maſt. This contains Length, Breadth and Depth; that is, it is the Length, Breadth and Depth, multiplied together.

The RULE *is*

64 ſolid Quarters make a ſolid Inch, 1728 Inches make a ſolid Foot, 27 Feet a ſolid Yard. This ariſes from the following Reaſons, *viz*, $4 \times 4 \times 4 = 64$ Quarters; $12 \times 12 \times 12 = 1728$ Inches, and $3 \times 3 \times 3 = 27$ Feet.

EXERCISES.

1. There is a ſolid Piece of Timber, 4 Feet long, 3 Feet wide and 2 Feet high; how many ſolid Inches does it contain?

Anſ. 41472 Inches, for $4 \times 3 \times 2 \times 1728 = 41472$ Inches.

2. A Perſon has got a Piece of Ivory, 1 Foot 3 Inches long, 10 Inches wide, and 6 Inches deep; and he is to cut them into Dice or Dies, each 1 Quarter of an Inch Square on every Side; how many Dies will it make?

Anſ. 57600.

Sch. I humbly thank you, Sir, and I will take care to work theſe Queſtions, for I underſtand the Rules very well.

Maſt. Then, my dear Scholar, I will now ſhew you the beſt of Rules, and upon which the very Foundation of Mathematics depends.

Sch. What is that?

Maſt. The *Golden Rule of Three.*

THE

RULE OF THREE DIRECT,

Commonly called,

The GOLDEN RULE, or RULE of PROPORTION.

Sch. *WHAT do you mean by the* Rule *of* Proportion ?

Maſt. It is that Rule which teaches the *Ratio*, *Analogy* or *Proportion*, which Numbers bear to each other by Compariſon, and theſe Numbers to be compared are never leſs than 4, *viz.* 3, which are given or belong to the Queſtion itſelf in Order to find the 4th, which 4th Number is the Anſwer.

Sch. Pray explain this farther to me ?

Maſt. I told you before, that never leſs than 3 Numbers are given in the Queſtion itſelf, and that the 4th Number will be the Anſwer required.

Sch. But how am I to find this 4th Number, before I know how to work the Rule ?

Maſt. You are right : Be careful then to attend to the following Rules or Obſervations, and you will ſoon make yourſelf Maſter of the whole.

RULE 1.

Read the Queſtion over 2 or 3 Times with due Conſideration, and you will find every Sum conſiſts of three Things or Parts, which when known, it will be eaſy to ſtate the Queſtion in a Manner fit for working. Thus, if 2 Yards coſt 4*s*. what coſt 8 Yards ? *Anſ.* 16*s*.

RULE 2.

3. Now to ſtate this or any other plain Queſtion, you muſt firſt obſerve, that there are 2 Numbers of one and the ſame Name and Denomination, that is, there are 2 Numbers of Meaſure, or under the Name of Yards, and

one

one Number is Money; therefore make your firſt and third Number of the ſame Name, that which ſuppoſes the Thing, or comes after the Word If, muſt be your firſt Number, which in this Caſe is 2; then the Demand what coſt muſt be your third Number, which here is 8 Yards, and whatever Anſwer your Queſtion is to have; it will always be of the ſame Name as your ſecond or middle Number—Thus 4*s.* is your middle Number, becauſe your Anſwer is to be in Money; therefore the Sum will ſtand or be ſtated thus.

	Yds.		*s.*		Yds.	
If	2	coſt	4	what coſt	8	*Anſ.* 16*s.*

RULE 3.

After the Queſtion is ſtated as above, and the firſt and third Number be alike in Name; then multiply your ſecond Number by the Third, or the Third by the Second, and divide by the Firſt, and the Quotient will be the Anſwer, or fourth Number, *viz*, 16 Shillings.

See the Work.

Yds.	*s.*	*Yds.*
If 2	4	8
	8	
	2)32	
	16*s.* *Anſ.*	

N. B. All Queſtions in this Rule are performed in the ſame manner; I ſhall therefore proceed to ſhew you how theſe 4 Numbers, *viz*, 2, 4, 8 and 16, are in Proportion to each other; for *this* is the true underſtanding of the Rule of *Proportion* itſelf, and not merely or barely working of the Rule.

A PROOF *of the Rule of* PROPORTION.

1. Let the Numbers be 2, 4, 8 and ſixteen, as before. Then as 2 : 4 :: 8 : 16.

That is, as the 1ſt is to the 2d, ſo is the 3d to the 4th, for the firſt Number 2, multiplied by the 4th 16, is equal

to

to the 2d multiplied by the 3d, *viz.* 2 × 16 = 32 and 4 × 8 = 32.

2. Again, the 4th divided by the 2d, will be equal to the 3d divided by the firſt: thus, 16 ÷ 4 is = 8 ÷ 2 = 4; alſo the 4th divided by the 3d, will be equal to the 2d divided by the 1ſt.—That is 16 ÷ 8 is = 4 ÷ 2 = 2.

This Law, Canon or Rule, will always hold good in all other Numbers as well as theſe; and therefore it is very eaſy you ſee, to prove the Work of any Queſtion in this Rule.

Sch. I perceive it plainly, and it appears to me very natural and eaſy.

Maſt. Then I ſhall give you a ſufficient Number of Examples for Exerciſe, and if you attend to the foregoing Rules, you will not be at any loſs to underſtand them, and the manner how to work them.

EXAMPLES *in ſingle Statings.*

1. If 5 Ells coſt 17 *s.* what coſt 25 Ells? *Anſ.* 4 *l.* 5 *s.*

2. If three Pounds of Tobacco coſt 3 *s.* 6 *d.* what coſt 27 Pounds? *Anſ.* 1 *l.* 11 *s.* 6 *d.*

3. If 1 Yard coſt 2 *s.* 3 *d.* what coſt 127 Yards? *Anſ.* 11 *l.* 19 *s.* 3 *d.*

4. If I ſpend five Farthings a Day, how much is that at the Year's end? *Anſ.* 1 *l.* 18 *s.* 0 *d.* $\frac{1}{4}$.

5. If 1 pound of Sugar coſt 9 Pence, what coſt 4 Cwt. 1 qr. 14 lb? *Anſ.* 18 *l.* 7 *s.* 6 *d.*

6. If 4 Cwt. 1 qr. 14 lb. of Sugar coſt 18 *l.* 7 *s.* 6 *d.* what coſt 1 lb? *Anſ.* 9 *d.*

7. If 1 Buſhel of Coals coſt 10 *d.* $\frac{1}{2}$, what is that per Chaldron? *Anſ.* 1 *l.* 11 *s.* 6 *d.*

8. If 5 Chaldron of Coals coſt 7 *l.* 17 *s.* 6 *d.* what coſt 1 Buſhel? *Anſ.* 10 *d.* $\frac{1}{2}$.

9. At 4 *s.* 6 *d.* per Buſhel, what coſt 20 Quarters, *viz.* 4 Loads? *Anſ.* 36 *l.*

10. If 20 Quarters of Malt coſt 36 *l.* what is the Price of 1 Buſhel? *Anſ.* 4 *s.* 6 *d.*

11. Bought a ſilver Tankard and pint Mug, which weighed together 4 lb. 2 oz. they both coſt me 14 *l.* 7 *s.* 6 *d.* I demand what they coſt per Ounce? *Anſ.* 5 *s.* 9 *d.*

12. If I have an Income of 600 *l.* a Year, what is it per Day? *Anſ.* 1 *l.* 12 *s.* 10 *d.* $\frac{1}{2}$. $\frac{30}{365}$.

13. If

13. If a Pint of Wine coſt 10*d.* what coſt three Pipes or 6 Hogſheads? *Anſ.* 126*l.*

14. What coſt 5 Pieces of Iriſh, each 24 Yards long, at 2*s.* per Yard? *Anſ.* 12*l.*

15. Bought a Parcel of Holland, which coſt me 33*l.* and gave after the Rate of 7*s.* 6*d.* per Yard for it, I demand the Quantity? *Anſ.* 88 Yards.

16. If 3 cwt. of Cheeſe coſt me 5*l.* 12*s.* what is that per Pound? *Anſ.* 4*d.* per lb.

17. Bought as many Candles at 7*d.* per Pound as coſt me 11*l.* 4*s.* I demand how many Dozen there were?

Anſ. 32 Dozen.

18. Bought 3 Bags of Hops which weighed 518 lb. and coſt me 8*l.* 12*s.* 8*d.* what did they coſt per lb?

Anſ. 4*d.* per lb.

19. Bought 415 lb. of green Tea, for 332*l.* I demand what it coſt per Pound? *Anſ.* 16*s.* per lb.

20. Bought 12 Pieces of Cloth, containing 320 Yards, which coſt me 20*l.* what is that per Yard?

Anſ. 15*d.* per yd.

21. Bought a Cwt. of Tea, which coſt me 30 Guineas, what does it ſtand me in per Pound? *Anſ.* 5*s.* 7*d.*$\frac{1}{2}$. per lb.

22. I ſold 189 oz. 14 dwts. 10 grs. of Silver, at the Rate of 7*s.* 9*d.* $\frac{1}{2}$. per Ounce, what comes it to?

Anſ. 73*l.* 18*s.* 2*d.* $\frac{3}{4}$.

23. A Gentleman has an Eſtate of 251*l.* 12*s.* 6*d.* per Annum, what may he allow Himſelf to ſpend every Day to lay up every Year 60*l.* out of his Income?

Anſ. $\frac{1}{2}$ a Guinea a Day.

24. A Plumber bought 9 Cwt. of Lead, which coſt him 6 Guineas, I demand what it coſt per Pound? *Anſ.* 1 *d.*$\frac{1}{2}$.

25. A Hop Merchant bought 2 Bags of Hops, each weighing 1 cwt. 2 qrs. 10 lb for which he gave 8 Guineas, and ſold them by Retail in his Shop at 7*d.* $\frac{1}{2}$. per Pound, what did he gain or loſe? *Anſ.* He gained 2*l.* 4*s.* 6*d.*

26. A Grocer bought an equal Quantity of Sugar, Tea and Tobacco for 704*l.* 3*s.* 4*d.* he gave 10*d.* $\frac{1}{2}$. per Pound for the Sugar, 5*s.* 9*d.* per Pound for the Tea, and 20*d.* $\frac{1}{2}$ per lb. for the Tobacco. I demand how many lbs. he had of each Sort? *Anſ.* 1690 lbs. of each.

27. What is the Intereſt of 654*l.* 8*s.* 4*d.* for 1 Year, at 5*l.* per Cent? *Anſ.* 32*l.* 14*s.* 5*d.*

28. What is the Intereſt of 1750*l.* 13*s.* 6*d*$\frac{1}{2}$. for 1 Year, at 4*l.* per Cent? *Anſ.* 70*l.* and 6*d*$\frac{1}{2}$.

29.

29. A Woollen-Draper bought 4 Packs of Broad Cloth, each Pack containing 3 Parcels, each Parcel 7 Pieces, and each Piece 35 Yards long, and gave after the Rate of 13*s*, 4*d*. per Yard I demand what the Whole coſt ?

Anſ. 1960*l*.

30. A Merchant bought 4 Cheſts of Cambrick, each Cheſt contained 3 Parcels, each Parcel 7 Pieces, and each Piece was 17½ Yards long, for which he gave 980*l*. I demand what it coſt him per Yard ? *Anſ.* 13*s*, 4*d*. per Yd.

31. If 1 Ell *Engliſh* of Holland coſt 5*s*. 3*d*. what coſt 340 Yards ?

N. B. Bring the firſt Numbers into Quarters and 340 Yards into Quarters, and after they are of one Name proceed as before, you'll find the Anſwer 71*l*. 8*s*.

31. A Cheeſemonger bought 650 Cheeſes, weighing one with another 10 lb. each, which coſt him 80 Guineas, now he ſold them by Retail in his Shop for 3*d*.½ per lb. I demand what he gained or loſt by them ?

Anſ. He gained 10*l*. 15*s*. 10*d*.

33. A Tobacconiſt ſent abroad 20 Hogſheads of Tobacco, each weighing 11 cwts. 3 qrs. and ſold them at the Rate of 7*l*. 10*s*. per cwt. his Correſpondent remitted him in Part of Payment 1500 Guineas, I demand the Balance ? *Anſ.* 187*l*. 10*s*.

34. Two Perſons walking together till they came to a very high Steeple, one ſays to the other, I wonder how many Yards high it is ? ſays his Companion, I'll ſoon tell you : He then ſet up his walking Stick, which was 1 Yard 9 Inches long, and the Sun ſhining bright, he meaſured the Shade of the Stick which was 5 Yards long ; he alſo meaſured the Shadow of the Steeple, and found it 172 Yards long. I demand the Height of the Steeple ? *Anſ.* 43 Yards.

35. Bought 12 Rolls of Cloth, each containing 36 Ells, which coſt me 45*l*. I demand how many Yards there was in all, and what the Cloth coſt per Yard ?

Anſ. There was 540 Yards, and which coſt 20*d*. a Yard.

36. A Merchant became a Bankrupt, and his Debts amounted to 8760*l*. 10*s*. but all his Effects and Book Debts amount to no more than 5475*l*. 6*s*. 6*d*. what will this enable him to pay in the Pound ? *Anſ.* 12*s*. 6*d*.

37. A

37. A Perſon borrowed of his Friend 1000 *l.* and ſome Time after was obliged to leave off Trade; a Compoſition was made of 12 *s* 6 *d.* in the Pound, what did his Friend receive for his Debt? *Anſ.* 625 *l.*

38. A Merchant bought a Quantity of Holland, which coſt him 192 *l.* 4 *s* he gave for it after the Rate of 7 *s.* 9 *d.* per Yard. I demand how many Ells there were?

Anſ. 396$\frac{4}{5}$ Ells.

39. A Wine Cooper imported 18 Pipes of Wine, (each 126 Gal.) which coſt him at firſt Purchaſe 549 *l.* 10 *s.* 6 *d.* the Freight of it coſt him 33 *l.* 12 *s.* Cuſtoms 61 *l.* 1 *s.* Loading, Unloading, Carts and Porters 17 *l.* 6 *s.* 6 *d.* I demand what this Wine ſtood him in per Gallon? *Anſ.* 5 *s*, 10 *d.*

If you attend duly to the Queſtions, you will be able to do any Thing that has only a ſingle Stating in the Queſtion.

Sch. I am highly obliged to you, depend upon my beſt Endeavours; but you ſay I ſhall be able to do any Sum that requires but one Stating, pray what am I to do then with ſuch Queſtions as require two or more Statings?

Maſt. If you conſider the true Nature of the Queſtion propoſed, by obſerving what is given, and what is required, you will ſoon underſtand the Manner of the Operation, and eaſily find an Anſwer.

Sch. You very readily expreſs how eaſy I may come to the Anſwer; but I know I cannot ſo eaſily, nor ſo very readily anſwer Queſtions of this Sort; therefore pray indulge me with two or three Examples, and inſtruct me in the firſt of them, I'll aſk no more?

Maſt. My Deſire, you know, is to improve you, and as you are ſo deſirous of it, you ſhall not want for Inſtruction.

EXAMPLES, *requiring more than one ſtating.*

1. How many Pounds of Candles at 7 *s.* 6 *d.* per Pound may I have for 4 C. 3 qrs. 14 lb. of Tallow, at 5 *d.* per lb. *Anſ.* 30$\frac{1}{3}$ Dozen, that is 30 Dozen and 4 Candles.

N. B. Now to perform all ſuch like Queſtions, obſerve, that one Part is poſitive or done in Effect, and the other is required, which muſt be your laſt Work: Thus you are told poſitively, that there is 4 cwt. 3 qrs. 14 lb. of Tallow ſold or delivered at 5 d. per lb. Therefore for your firſt Stating ſay, Firſt,

If

If 1 lb. coſt 5*d.* what coſt 4 cwt. 3 qrs. 14 lb.

Anſ. 11*l.* 7*s.* 6*d.*

Then, if 7*s.* 6*d.* buy 1 dozen what will 11*l.* 7*s.* 6*d.* buy?

Anſ. 30 $\frac{3}{9}\frac{2}{0}$ Dozen or 30 $\frac{1}{3}$ Dozen which is 30 Dozen and 4 over.

Sch. I thank you, Sir, very kindly, now pleaſe to leave me another Example or two for Trial?

Maſt. I will.

2. Bought a Ton of Iron and Steel (there being in Number 130 Bars) which coſt me 29*l.* 3*s.* 4*d.* there were 70 Bars of Steel which weighed each 8 lb. and coſt 5*d.* per lb. I demand what the Iron and Steel weighed? what they coſt ſeparately? what the Iron coſt per lb. and what each Bar weighed one with another?

Anſ. There was 15 cwt. of Iron, and 5 cwt. of Steel, the Iron coſt 17*l.* 10*s.* and the Steel coſt 11*l* 13*s.* 4*d.* and each Bar of Iron weighed 28 lb. and coſt 2$d\frac{1}{2}$. per lb.

3. How many pieces of Cambrick, each 12 Yards long, may I have for 12 cwt. 3 qrs. 21 lb. at 20*d.* per lb.

Anſ. 172$\frac{1}{2}$ Pieces.

4. A Draper bought a Quantity of Fuſtian and Shalloon, which coſt him 72*l.* there were 240 Yards of Fuſtian, at 3*s.* 6*d.* per Yard, and he had 3 Yards of Shalloon to every 2 Yards of Fuſtian. I demand how many Yards of Shalloon he had, what it coſt in all, and what it coſt per Yard?

Anſ. there were 360 Yards of Shalloon, which coſt 30*l.* and coſt 20*d.* per Yard.

Sch. I am obliged to you Sir: pray what comes next?

Maſt. Another uſeful Rule.

SECT. IX.

The SINGLE RULE *of* THREE INVERSE.

Sch. *WHAT do you mean by the* Rule of Three inverſe?

Maſt. It is the *Reverſe* of the Rule of Three Direct, and has 3 Numbers given to find a 4th; the Rule alſo is contrary to the Rule of Three Direct.

Sch. How ſo?

Maſt.

Maſt. Becauſe in the Rule of Three Direct, you multiplied your 2d, by your 3d, and divide by your 1ſt; here you muſt multiply your 1ſt by your 2d and divide by your 3d——An Example or two will ſoon make it plain to you.

EXAMPLES.

1. How many Yards of Shalloon, 3 qrs. wide, will line 9 Yards of Cloth, 5 qrs wide?

qrs.	yds.	qrs.
If 5	9	3

5

3)45

Anſw. 15 Yards.

2. How many Yards, Yard wide, will line 30 Yards of Cloth 6 qrs. wide? *Anſ.* 45 Yards.

3. How many Yards of Tapeſtry, or other Stuff that is Yard wide, will cover a Floor 16 Feet long and 15 Feet wide. *Anſ.* 80 Feet, or 26 Yards 2 Feet.

4. If 8 Men build a Houſe in 48 Days, how many will build the ſame, or one of the ſame ſort in 16 Days?

Anſ. 24 Men.

5. A running Footman performs a Journey in 15 Days, when the Days are 8 Hours long, in how many Days will he do the ſame, when the Days are 12 Hours long?

Anſ. 10 Days.

6. There were 1200 Soldiers in a Garriſon, who had Proviſions only for ſix Weeks; how many muſt be ſent away, and how many ought to ſtay that the ſame may laſt them 18 Weeks? *Anſ.* 400 may ſtay, and 800 depart.

7. A Perſon lent me 1000*l.* for 9 Months, on Condition I would lend him a Sum on Occaſion: he afterwards borrowed of me 750*l.* I demand for how long a Time I ought to lend it him to return the Kindneſs he had done me? *Anſ.* 12 Months.

8. A Regiment of Soldiers, conſiſting of 900, are to have new Coats, each containing 3 yds. 2qrs. of Cloth 5 qrs. wide, and they are to be lined with Shalloon, which

is 3 qrs. wide, I demand how many Yards of Cloth there are in all for their Coats, and how many Yards of Shalloon it will take to line them?

Anſ. The Quantity of Cloth is 3150 Yards, and it will take 5250 Yards of Shalloon to line them.

9. If for 30*s.* I have 9 C. 3 qrs. 21 lb. carried 50 Miles, how many Pounds ought I to have carried 150 Miles for the ſame Money?

Anſ. 3 C. 1 qr. 7 lb. or 371 lb.

* 10. If when Flower is ſold for 6*s.* 8*d.* per Buſhel, a three penny Loaf weighs 2 lb. 6 oz. how much ought it to weigh, when the ſame Sort of Flour is ſold for 5*s.* per Buſhel? *Anſ.* 3 lb. 4 oz.

* N. B. You are to remember, that this laſt Queſtion is done by Troy Weight, 12 oz. to the lb. &c.

SECT. X.

The Double RULE of THREE DIRECT, AND The Double RULE of THREE INVERSE.

Sch. WHAT do you mean by theſe two Rules?

Maſt. They are called plural Proportion; that is when 5 Numbers are given to find a 6th. The 1ſt. of theſe is performed by two direct Operations of the ſingle Rule of Three Direct, and the other is performed by two ſingle Operations, one of which is Direct and the other Inverſe, for they are never both Inverſe.

Note. As theſe Rules are ſeldom put in Practice; but are performed by one Operation, by the five Numbers being ranked or placed in due Order, there is no Occaſion to give any Examples at Length in either of them; but I ſhall propoſe one Queſtion in both, and afterwards ſhew you how to perform the ſame by the Rule of Three of five Numbers.

An EXAMPLE *in the* Double Rule of Three Direct.

If 100 *l.* in 12 Months gain 5 *l.* Intereſt, what will 80 *l.* gain in 9 Months?

	l.	*l.*	*l.*		
First, If 100	——	5	——	80	*Anſ.* 4 *l.* Then,
mths.		*l.*		mths.	
If 12	——	4	——	9	*Anſw.* 3 *l.*

And thus for any other Queſtion.

An EXAMPLE *in the* Double Rule of Three Inverſe.

If 100 *l.* Principal in 12 Months gain 5 *l.* Intereſt, what Principal will gain 3 *l.* in 9 Months?

First, Direct.

	l.		*l.*		
If 5	——	100	——	3	*Anſ.* 60 *l.* Then,

Inverſe.

mths.		*l.*		mths.	
If 12	——	60	——	9	*Anſ.* 80 *l.* Principal.

SECT. XI.

The Rule of Three of Five Numbers.

Scho. *HOW is this performed?*

Maſt. When any Queſtion is given in the *Double Rule of Three Direct*, then it is performed as follows.

RULE.

Firſt, make your 1ſt. and 4th. Numbers of the ſame Name or Denomination, as alſo your 2d. and your 5th. and let the middle Number be of the ſame Name that your Anſwer is required in. Then,

2dly. Multiply your 1ſt. and 2d. together, for a Diviſor, and your 3d, 4th, and 5th together, for a Dividend,

dend, and the Quotient will be the Anſwer in the ſame Name your middle Number is in.

Or,

Multiply your 1ſt. and 2d. Numbers together, for a new firſt Number, and your 4th. and 5th. for a new 3d. Number; ſo will the 5 Numbers be reduced to 3, and will become a plain Sum in the *Single Rule of Three Direct*, and muſt be proceeded with accordingly.

EXAMPLES.

1. If 100 *l.* in 12 Months gain 5 *l.* Intereſt, what will 80 *l.* gain in 9 Months?

The Work.

l.	*m.*	*l.*	*l.*	*m.*
If 100	—— 12	—— 5	—— 80	—— 9
12				80
1200	——	—— 5	——	720
				5
				12|00)36|00
				3 *l. Anſ.*

2. If 20 Workmen build 40 Stands, or Booths, in 30 Days, how many Booths, or Stands, will 80 Men build in 15 Days? *Anſ.* 80 Booths.

3. Suppoſe it coſt me 10 *l.* a Week for the Wages of 8 Men; what will it coſt me for 40 Men, having the ſame Pay, for 7 Weeks? *Anſ.* 300 *l.*

4. If a Regiment, conſiſting of 900 Soldiers, eat up 300 Quarters of Wheat in 150 Days; I demand how many Quarters 7200 Soldiers will eat in 50 Days, at the ſame Rate? *Anſ.* 800 Quarters.

5. A General of an Army has 500 Horſes, which in 30 Days, one with another, eat 50 Quintals of Oats; but his Enemy encreaſing in Numbers, he was obliged to ſend for a Reinforcement of 3000 more Horſes, and found that he muſt provide Proviſion for the whole for full 90 Days; I demand

I demand how many Quintals they will eat in that Time? *Anſ.* 1050 Quintals.

QUESTIONS INVERSE.

When a Queſtion of 5 Numbers prove to be *inverſe*, then make of it a ſingle Rule of Three inverſe Queſtion, as follows.

RULE.

Firſt ſet the two conditional Numbers one over the other, then place your middle in Order, and ſet after this the two Numbers, one over the other, in which the Demand lies. —— Then multiply the lower Number of the 1ſt. by the upper Number of the 2d. for a new 1ſt. Number, and upper Number of the 1ſt. by the lower Number of the 2d. for a new 3d. Number; then proceed as in the *Single Rule of Three Inverſe*, and you will have the Anſwer required.

EXAMPLE.

If 100 *l.* in 12 Months gain 5 *l.* Intereſt, what Principal will gain 3 *l.* in 9 Months? Work,

5 *l.*	3 *l.*
12 mths.	9 mths.

Now, 12 × 3 = 36, and 5 × 9 = 45; then,

If 36 —— 100 —— 45 Inverſe. *Anſ.* 80 *l.*

Or thus:

Having ranked the 5 Numbers in due Order, as the Condition of the Queſtion requires: Then,

RULE 2.

Multiply your 2d. and 4th. together, for a 1ſt. Number, and your 1ſt. and 5th. together, for a 3d. Number, and proceed as before. Thus,

l.	*m.*	*l.*	*l.*	*m.*
If 5	12	100	3	9.

Firſt, 12 × 3 = 36, 1ſt. Number; 5 × 9 = 45, 3d. Number, as before. Do you underſtand it? if not, look it over again ſedately.

2. If 20 Men in 30 Days build 40 Sheds, or Booths, how many Men will build 80 Booths in 15 Days? *Anſ.* 80 Men.

SECT. XII.

Of Tare and Trett.

Scho. What do you mean by the Rule of Tare and Trett?

Maſt. It is no Rule of itſelf, being no other than the *Rule of Three Direct*, uſed with the Rule of *Subtraction*, by taking out Allowances for the Waſte of Commodities, *&c.*

Sch. Pleaſe to tell me what theſe Allowances are, what they are called by Name, and how taken off?

Maſt. I will: But you muſt firſt of all underſtand that the Groſs Weight comes firſt of all, and the Allowances follow after, in the following Order.

1. *Groſs*, or *Groſs-Weight*, is the whole Weight of the Caſk, Barrel, or Bag, with the Commodity and all contained therein.

2. *Tare* is the Allowance made for the Weight of the Caſk, or Bag, which is weighed by the Seller before he puts in the Commodity, and by the Buyer after he takes the Commodity out. Thus, ſuppoſe a Hogſhead of Sugar ſhould weigh 9 cwt. 3 qrs. 14 lb. Groſs, *viz.* Hogſheads and all; and when it is emptied, the Caſk itſelf only ſhould weigh 3 qrs. 14 lb. — This is called the *Tare*, then follows.

3. *Neat Weight*, that is when the *Tare* is taken out of, or ſubtracted from, the *Groſs*, the Remainder will be the *Neat-Weight*: Thus, as was ſaid before, 3 qrs. 14 lb, *Tare*, taken out of 9 cwt. 3 qrs. 14 lb. *Groſs*, there will remain 9 cwt. *Neat-Weight*.

4. *Trett* is Allowance of 4 lb. every 104 lb. for

that is, 1 lb. in every 26 lb. therefore take the *Tare* firſt out of the *Groſs*, and then reduce them into Pounds, and call them then divide theſe Pounds by 26, and the Quotient will be the *Trett* Pounds; which take out of the Remainder, is the *Neat* Weight.

N. B.

N. B. There are other Allowances, ſuch as *Clough*, or *Cloff*, *&c.* but theſe are ſeldom uſed or allowed for but on very extraordinary Occaſions.

EXAMPLES.

1. Bought 3 Hhds. of Sugar, each weighing 14 cwt. 2 qrs. 14 lb. *Tare* of each 3 qrs. 11 lb. I demand the *Neat* Weight? *Anſ.* 41 cwt. 1 qr. 9 lb.

2. A Grocer bought 4 Hhds of Sugar: (No. 1.) weighed *Groſs* 10 cwt. 3 qrs. 7 lb. (No. 2.) 13 cwt. 2 qrs. (No. 3.) 15 cwt. 1 qr. 11 lb, and (No. 4.) 13 cwt. 1 qr. 26 lb. *Tare* of the whole 5 cwt. 1 qr. 2 lb. *Trett* 4 lb. for every 104, (or 1 lb. every 26 lb.) what is the *Neat Weight*; and what come they to, at 2 Guineas *per* cwt. *Anſ.* 96 *l.* 13 *s.* 6 *d.*

*** Add the 4 Hhds. together, you will find the *Groſs* 53 cwt. and 16 lb. take the *Tare* out of this, and you will find it 47 cwt. 3 qrs. 14 lb. *Suttle*, which is 5362 lb. *Suttle*. This, divided by 26, gives 206 lb. *Trett*; which taken from the 5362 lb. *Suttle*, leaves 5156 lb. *Neat*; which, at 2 Guineas *per* cwt. you will find coſt 96 *l.* 13 *s.* 6 *d.* ——— From this Example you may do any other by Care and Obſervation.

Sch. I return you Thanks, Sir; I will try my beſt, you may depend.

Maſt. Then you will be qualified for the *Rule of Practice.*

SECT. XIII.

Of Practice.

Sch. What do you mean by the Rule of Practice?

Maſt. *Practice* is ſaid to be ſo called, from its being a *practical Rule* of Buſineſs, being ſo adapted, that thoſe who are Maſters of it, can caſt up, or tell what any Commodity comes to, in a very ſhort Time, without the Trou-

ble

ble of reducing the Price into its loweſt Terms, as in the *Rule of Three Direct.*

Sch. How is it performed?

Maſt. By *Multiplication* and *Diviſion*, or by *Diviſion* only.

Sch. Pray inform me how?

Maſt. I will; but you muſt firſt of all learn the following *Tables* perfectly.

TABLE I.

Of the aliquot, or even Parts of a Pound Sterling.

s.	*d.*	*Parts.*	
10	0	$\frac{1}{2}$	*of a Pound Sterling.*
6	8	$\frac{1}{3}$	
5	0	$\frac{1}{4}$	
4	0	$\frac{1}{5}$	
3	4	$\frac{1}{6}$	
2	6	$\frac{1}{8}$	
2	0	$\frac{1}{10}$	
1	8	$\frac{1}{12}$	
1	3	$\frac{1}{16}$	
1	0	$\frac{1}{20}$	

TABLE II.

Of the even Parts of a Shilling.

Pence		
6	is $\frac{1}{2}$	*of a Shilling.*
4	$\frac{1}{3}$	
3	$\frac{1}{4}$	
2	$\frac{1}{6}$	
$1\frac{1}{2}$	$\frac{1}{8}$	
1	$\frac{1}{12}$	

EXAMPLES.

Caſe 1.

When the Price of the Integer is Farthings, then reduce them into Pence, Shillings, and Pounds, as you did in *Reduction.*

I ſhall work a few Queſtions at large, and the reſt I ſhall leave for your Practice.

lb.

$\frac{1}{4}$	$\frac{1}{4}$	1765 at $\frac{1}{4}$ per lb.	
1 *d*	$\frac{1}{12}$	441 – $\frac{1}{4}$	
2	0	3 6 9 *d.*	
		£. 1 16 9$\frac{1}{4}$	*Anſ.*

lb.

$\frac{1}{2}$	$\frac{1}{2}$	1765 at $\frac{1}{2}$ per lb.	
1 *d*	$\frac{1}{12}$	882 – $\frac{1}{2}$	
2	0	7 3 – 6	
		£. 3 13 6$\frac{1}{2}$	*Anſ.*

1765

lb.

		1765 at $\frac{3}{4}$ per lb. **	
		3	
$\frac{1}{4}$	$\frac{1}{4}$	5295 Farthings	
1*d*	$\frac{1}{12}$	1323 — $\frac{3}{4}$	
	2|0	11| 0 — 3*d.*	
	£.	5 10 $3\frac{3}{4}$ *Anſ.*	

lb.

1*d*	$\frac{1}{12}$	1765 at 1*d.* per lb.	
	2|0	14|7 — 1	
		*£.*7 7 1 *Anſ.*	

** *N. B.* This third Example may alſo be done by dividing by $\frac{1}{8}$, $\frac{1}{2}$, and $\frac{1}{20}$, becauſe $\frac{3}{4}$ is $\frac{1}{8}$ of 6 Pence; then divide by $\frac{1}{2}$, it will be Shillings, and by $\frac{1}{20}$, it will be Pounds Sterling.——Always remember every Remainder is of the ſame Name as the Dividend.

1*d.*	$\frac{1}{12}$	1765 at $1\frac{1}{4}d.$	
$\frac{1}{4}$	$\frac{1}{4}$	147 — 1*d.*	
		36 — $9\frac{1}{4}$	
	2|0	18| 3 — $10\frac{1}{4}$	
		*£.*9 3 $10\frac{1}{4}$ *Anſ.*	
2*d*	$\frac{1}{6}$	1765 at $2\frac{1}{2}d.$	
$\frac{1}{2}$	$\frac{1}{4}$	294 — 2	
		73 — $6\frac{1}{2}$	
	2|0	36| 7 $8\frac{1}{2}$	
	£.	18 7 $8\frac{1}{2}$ *Anſ.*	
3*d*	$\frac{1}{4}$	1765 at $3\frac{3}{4}d.$	
$\frac{3}{4}$	$\frac{3}{4}$	441 — 3*d.*	
		110 — $3\frac{3}{4}$	
	2|0	55| 1 $6\frac{3}{4}$	
	£.	27 11 $6\frac{3}{4}$ *Anſ.*	

4*d.*	$\frac{1}{3}$	1765 at $5\frac{1}{4}d.$	
1	$\frac{1}{4}$	588 — 4*d.*	
$\frac{1}{4}$	$\frac{1}{4}$	147 — 1	
		36 — $9\frac{1}{4}$	
	2|0	77| 2 $2\frac{1}{4}$	
		*£.*38 12 $2\frac{1}{4}$ *Anſ.*	
4*d*	$\frac{1}{3}$	1765 at $5\frac{1}{2}d.$	
1	$\frac{1}{4}$	588 — 4*d.*	
$\frac{1}{2}$	$\frac{1}{2}$	147 — 1	
		73 — $6\frac{1}{2}$	
	2|0	80|8 $11\frac{1}{2}$	
	£.	40 8 $11\frac{1}{2}$ *Anſ.*	

d.

6*d*	½	1765 at 10½*d*.
3	½	882 – 6
1½	½	441 – 3
	½	220 – 7½
2|0		154|4 – 4½
£.		77 4 4½

6*d*	½	1765 at 11¼*d*.
3	½	882 – 6
1½	½	441 – 3
¾	½	220 – 7½
		110 – 3¾
2|0		165| 4 8¼
£.		82 14 8¼

N. B. These Questions may be done shorter, but I have taken the more Parts, to make the Division more easy, and the Process more natural; and if they are well attended to, you will soon arrive at the Knowledge of every Thing of this Sort.

QUESTIONS *for* TRIAL.

4*d*	⅓	1753 at 5¾*d*.
1	¼	
¾	½	
	¼	
2|0		83|9 *s.* 11¼
£.		41 19 11¼ *Anſ.*

4*d*	⅓	1753 at 7¼*d*.
2	¼	
1	½	
¾	¼	
2|0		113| 2 *s.* 1¾*d*.
£.		56 12 1¾ *Anſ.*

d.		
3	¼	1753 at 6¼*d*.
3	¼	
¼	1/12	
2|0		91 | 3 *s.* –¼
£.		45 13 – ¼ *Anſ.*

Or thus rather.

6*d*	½	1753
1½	¼	
¼	1/6	
2|0		113| 2 *s.* 1¾*d*.
£.		56 12 1¾ *Anſ.*

4*d*	⅓	1753 at 8½*d*.
4	⅓	
½	⅛	
2|0		124| 1 *s*. 8½
£.		62 1 8½ *Anſ.*

6*d*	½	1753 at 10½*d*.
3	½	
1½	½	
2|0		153| 3*s*. 10½
£.		76 13 10½

6*d*	½	1753 at 9¾*d*.
3	½	
¾	¼	
2|0		142|4 *s*. 3¾*d*.
£.		71 4 3¾ *Anſ.*

6*d*	½	1753 at 11¼*d*.
3	½	
1½	½	
¾	½	
2|0		164| 3*s*. 5¼*d*.
£.		82 3 5¼

Caſe 2.

When the Price is above 1 Shilling and under 2 Shillings, then let the Number, or Quantity given, ſtand without drawing any Line under it, and proceed with the odd Pence and Farthings, as before.

Thus 1765 Yards, at 12 *d*. per Yard, is 1765 *s*. or 88 *l*. 5 *s*. Therefore ſuppoſe it were 1765, at 15¾ *d* I leave 1765 ſtanding, which are Shillings, and work only with the odd 3¾ *d*. as before.

See EXAMPLES.

3*d*	¼	1765 at 15¾*d*.
¾	¼	441 — 3
		110 — 3¾
2|0		231| 6 *s*. 6¾
£.		115 16 6¾ *Anſ.*

4*d*	⅓	1765 at 17½*d*.
1	¼	
½	½	
2|0		257|1 11½

d.

6d	½	1765 at 22½d.
3	½	
1½	½	
2|0		330|9 s. 4½d.
£.		165 9 4½

6d	½	1765 at 23¼d.
3	½	
1½	½	
¾	½	
2|0		341|19 s. 8¼ d.
£.		170 9 8¼

Case 3.

When the Price given is above 2 Shillings, and under 20 Shillings, then multiply by the Shillings, and take the Parts of the Pence and Farthings, as in the laſt Caſes.

EXAMPLES.

* 575 at 3 s. 9¾ d.

3

*6d	½	1725
3	½	287 – 6 d.
¾	¼	143 – 9
		35 – 11¼
2|0		219 | 2 – 2¼
£.		109 12 2¼ *Anſ.*

* 575 at 11 s. 5¼ d.

11

*4d	¼	6325
1	¼	191 – 8d.
¼	¼	47 – 11
		11 – 11¾
2|0		657| 6 – 6¾
£.		328 16 6¾

** *N. B.* When I ſay 6 *d.* is the ½. I don't take the ½ of 1725, for that is the Price of 3 Shillings; but I take the ½ of the Top Number 575. I do the ſame in Exam. 2, for 4*d.* is ⅓ of a Shilling, not of 11 Shillings.

475 at 15*s.* 10*d.* ½.
15

6*d* ½
3 ½ ½
1½ ½

2|0|754|0 – 7*d.* ½

£. 377 — 7*d.* ½

397 at 18*s.* 3*d.* ¾.
18

3*d* ¼
¾ ¼

2|0|727|0 – – ¾

£. 363 10*s.* — ¾

Caſe 4.

When the given Price is Pounds, Shillings, Pence, and Farthings, then multiply by the Pounds, and take the Parts of a Pound by Table I. and divide the given Number thereby; that is, divide by the Shillings, Pence, and Farthings, in their true Parts.

EXAMPLES.

*135 at 3*l.* 15*s.* 6*d.*
3

405
* 10*s* ½ 67 10*s.*
5 ½ 33 15
6*d* 1/10 3 7 6*d.*

£. 509 12 6 *Anſ.*

287 at 5*l.* 18*s.* 4*d.*
5

1435
10*s.* ½ 143 10
5 ½ 71 15
2 6*d* ½ 35 17 6
10*d* ⅓ 11 19 2

£. 1698 1 8 *Anſ.*

* Here in Exam. 1. I multiply by 3*l.* then I take the Parts of a Pound, ſaying, 10*s.* is the ½; and I take the ½ of 135, which is 67, and 1 remains over, which is 1*l.* then I ſay the ½ of 1*l.* is 10*s.* — 2dly, then I ſay 5*s.* is the ½ of 10*s.* and take the ½ of 67*l.* 10*s.* and that is 33*l.* 15*s.* and then I ſay, 6*d.* is the 1/10 of 5*s.* and therefore I take the 1/10 of 33*l.* 15*s.* and find it to be 3*l.* 7*s.* 6*d.* and the Total or Anſwer is 509*l.* 12*s.* 6*d.* Proceed the ſame with the other Examples, and I hope you will find them right and ſerviceable to you.

EXAMPLES *for* TRIAL.

1753 Yards at 5*d.* ¾. *Anſ.* 41*l.* 19*s.* 11*d.* ¾.
3506 Ells at 7*d.* ¾. *Anſ.* 113*l.* 4*s.* 3*d* ¼.
5259 lb. at 19*d.* ½. *Anſ.* 427*l.* 5*s.* 10*d.* ½.
329 oz. at 21*d.* ½. *Anſ.* 29*l.* 9*s.* 5*d.* ½.
595 lb. at 22*d.* ½ *Anſ.* 55*l.* 15*s.* 7*d.* ½.
375 Ells at 2*s.* 8*d.* ½. *Anſ.* 50*l.* 15*s.* 7*d.* ½.
1251 Yards at 5*s.* 10*d.* *Anſ.* 364*l.* 17*s.* 6*d.*
285 cwt. at 12*s.* 9*d.* ½. *Anſ* 182*l.* 5*s.* 7*d.* ½.
370 Load at 18*s.* 10*d.* *Anſ.* 348*l* 8*s.* 4*d.*
225 Tons at 37*s.* 6*d.* *Anſ.* 421*l.* 17*s.* 6*d.*
185 cwt. at 3*l.* 16*s.* 9*d.* *Anſ.* 709*l.* 18*s.* 9*d.*
45 hhs. at 12*l.* 18*s.* — ¾. *Anſ.* 580*l.* 12*s.* 9*d.* ¾.

Caſe 5.

When the given Price is an even Number of Shillings, then multiply the given Number, or Quantity, by half that given Number; then cut off the firſt or Unit Figure, and thoſe on the left Hand will be Pounds; and then double the Figure you cut off, and it will be the Shillings.

EXAMPLES.

456 Ells at 12*s.*	248 at 16*s.*
6	8
273|6	198|4
Anſ. 273*l.* 12*s.*	198*l.* 8*s.*

Of WEIGHT.

Sch. How is this performed?

Maſt. By taking the even Parts of Tons and Hundredweights, *&c.* (as you did in Money,) according to the following Table.

Table

Table of Weight.

Even Parts of a Ton. C. qrs.		Even Parts of a Cwt. qrs. lb.	
10 —	is $\frac{1}{2}$ of a Ton.	2 —	is $\frac{1}{2}$.
5 —	is $\frac{1}{4}$.	1 —	is $\frac{1}{4}$.
4 —	is $\frac{1}{5}$.	16	is $\frac{1}{7}$.
2 2	is $\frac{1}{8}$.	14	is $\frac{1}{8}$.
2 —	is $\frac{1}{10}$.	8	is $\frac{1}{14}$.
1 —	is $\frac{1}{20}$.	7	is $\frac{1}{16}$.

You will remember alſo to get this Table by Heart.

Sch. I will.

Maſt. Then you will be fit for the following

RULE.

Multiply the firſt Denomination of the Weight by the firſt Denomination or Name of the given Price; then take the Parts of the given Price (as in the laſt Caſe) out of the Top or firſt Denomination, till you have done with all the Parts of the given Price: This done, take the even Parts of the Weight of the firſt Name and divide the given Price into ſuch Parts; this done, add the whole together, and you have the Anſwer in Pounds or Shillings, according to the Price given.

Sch. This Rule is too intricate, Sir, for me to comprehend, without an Example or two.

Maſt. Then you ſhall have them.

C. Q. lb.
*5 3 14 at 2 *l.* 10 *s.*
2

10

10 *s.*	$\frac{1}{2}$	2 10 *s.*	
2 qrs	$\frac{1}{2}$	1 5	
1	$\frac{1}{2}$	12	6 *d.*
14 lb	$\frac{1}{2}$	6	3
£.		14 13	9

10 *s.*	$\frac{1}{2}$	2	
2	$\frac{1}{2}$	1	
10 C.	$\frac{1}{2}$	5	q
5 q	$\frac{1}{4}$	1	1
1 1			

T. C. Q.
14 16 1 at 8 *l.* 12 *s.*
8

£.		127	7	9

* Here in Example 1. I multiply 5 cwt. by the Price of 2 *l.* and it gives 10 *l.* then I ſay, 10 *s.* is $\frac{1}{2}$ of a Pound, therefore,

therefore, as 5 cwt. at 1 *l.* per Hundred is 5 *l.* conſequently 5 cwt. at 10 *s.* per Hundred muſt be the Half of that, *viz.* 2 *l.* 10 *s.* Now all the Money, Value, or Price, being done, I proceed to the odd Weight, and ſay, that 2 qrs. is $\frac{1}{2}$ of a Hundred-weight, therefore I take the $\frac{1}{2}$ of the Price per Cwt. *viz.* 2 *l.* 10 *s.* and it is 1 *l.* 5 *s.* then I ſay, 1 qr. is the $\frac{1}{2}$ of 2 qrs. and take the $\frac{1}{2}$ of the Price of 2 qrs. and it is 12 *s.* 6 *d.* and laſtly, I ſay, 14 lb. is the $\frac{1}{2}$ of 1 qr. which is 6 *s.* 3 *d.* and having added all theſe together, I find the Sum or Total to be 14 *l.* 13 *s.* 9 *d.* Proceed thus with Example 2. and you will find the Anſwer 128 *l.* 15 *s.* 9 *d.*

More EXAMPLES.

35 cwt. 3 qrs. 10 lb. of Soap at 2 *l.* 2 *s.* 6 *d.* per Cwt. *Anſ.* 76 *l.* 3 *s.* 1 *d.*

19 cwt. 1 qr. 21 lb. of Sugar at 2 *l.* 12 *s.* 8 *d.* per Cwt. *Anſ.* 51 *l.* 0 *s.* 6 *d.* $\frac{3}{4}$.

29 cwt. 1 qr. of Tallow at 2 *l.* 17 *s.* *Anſ.* 83 *l.* 7 *s.* 3 *d.*

144 cwt. 3 qr. 8 lb. of Hops at 8 *l.* 11 *s.* 4 *d.* per Cwt. *Anſ.* 1240 *l.* 12 *s.* 8 *d.*

14 Ton 16 cwt. 3 qrs. 21 lb. at 11 *l.* 13 *s.* 4 *d.* per Ton. *Anſ.* 173 *l.* 4 *s.* 3 *d.* $\frac{1}{4}$.

29 Ton 13 cwt. 3 qrs. 14 lb. at 5 *l.* 16 *s.* 8 *d.* per Ton. *Anſ.* 173 *l.* 4 *s.* 3 *d.* $\frac{1}{4}$.

Sch. I will try at theſe Queſtions. But pray, what is the next Thing I am to learn?

Maſt. It is the moſt neceſſary Rule of all.

SECT. XIV.

VULGAR FRACTIONS.

Sch. WHAT do you mean by a Vulgar Fraction?

Maſt. A *Fraction* is a broken Number, or Part of an Unit or Integer, and conſiſts of two Parts; one called the *Numerator*, and the other the *Denominator*. Thus $\frac{3}{4}$, or $\frac{5}{9}$, or $\frac{17}{95}$, are expreſſed 3 Fourths, 5 Ninths, and 17 Ninety fifth Parts of Unity or an Integer.

Sch.

Sch. I underſtand this by the Rule of Practice : *But pray which are the Numerators and Denominators of theſe Fractions?*

Maſt. The Top Figures, 3, 5, and 17, are Numerators, and the lower ones, 4, 9, and 95, are their reſpective Denominators.

Sch. Are Fractions all of one Denomination?

Maſt. No, there are three Sorts, *viz.* 1. A *ſimple* or *proper Fraction*, which is, when the Numerator is leſs than the Denominator. Thus, the foregoing Fractions, $\frac{3}{4}$, $\frac{5}{9}$, $\frac{17}{95}$, *&c.* are all *ſimple* or *proper* Fractions,

2. An *improper Fraction* is that which has its Numerator larger than its Denominator, and ſuch are $\frac{4}{3}$, $\frac{9}{5}$, or $\frac{9}{7}\frac{5}{7}$, *&c.*

Note 1. All proper Fractions are leſs, or are only a Part of an Integer or Unit; but all improper Fractions are more in Value than an Unit.

3. A *compound Fraction* is ſuch as is compounded or coupled with another Fraction by the Word *of* — Thus $\frac{3}{4}$ of $\frac{5}{6}$; or $\frac{3}{5}$ of $\frac{5}{8}$ of $\frac{11}{12}$, are *compound* Fractions.

Note 2. All *compound Fractions* muſt be reduced to ſimple ones, and all *improper Fractions* into mixed Numbers.

4. A *mixed Number* conſiſts of 2 Parts, *viz.* a whole Number and a proper Fraction; thus $4\frac{2}{3}$, $15\frac{5}{9}$, and $168\frac{24}{27}$, are all mixed Numbers. Do you underſtand it?

Sch. I do very well.

Maſt. Then I will proceed to ſome Rules and Examples.

CASE I.

To reduce a mixed Number to an improper Fraction.

RULE. Multiply the whole Number by the Denominator of the Fraction, and take in the Numerator; then place this Product over the Denominator for a new Numerator, and it will be equal to the given mixed Number.

EXAMPLES.

Reduce $4\frac{2}{5}$ to an improper Fraction. *Anſ.* $\frac{22}{5}$.
Reduce $11\frac{7}{9}$ to an improper Fraction. *Anſ.* $\frac{106}{9}$.
Reduce $14\frac{5}{11}$ to an improper Fraction. *Anſ.* $\frac{159}{11}$.
Reduce $246\frac{11}{12}$ to an improper Fraction. *Anſ.* $\frac{2963}{12}$.

CASE 2.

To reduce an improper Fraction to its equivalent whole or mixed Number.

RULE. Divide the Numerator by the Denominator, the Quotient will be the whole Number, and if any Thing remains, place it over the Denominator for a new Numerator.

EXAMPLES.

Reduce $\frac{22}{5}$ to a mixed Number. *Anſ.* $4\frac{2}{5}$.
Reduce $\frac{106}{9}$ to a mixed Number. *Anſ.* $11\frac{7}{9}$.
Reduce $\frac{159}{11}$ to a mixed Number. *Anſ.* $14\frac{5}{11}$.
Reduce $\frac{2963}{12}$ to a mixed Number. *Anſ.* $246\frac{11}{12}$.
Reduce $\frac{45728}{96}$ to a mixed Number. *Anſ.* $476\frac{32}{96}$.

CASE 3.

To reduce a compound to a ſimple Fraction of the ſame Value.

RULE. Multiply the Numerators together for a new Numerator, and the Denominators together for a new Denominator.

EXAMPLES.

Reduce $\frac{2}{5}$ of $\frac{3}{4}$ to a ſimple or proper Fraction. *Anſ.* $\frac{6}{20}$.
Reduce $\frac{1}{5}$ of $\frac{4}{7}$ to a ſimple Fraction. *Anſ.* $\frac{4}{35}$.
Reduce $\frac{2}{3}$ of $\frac{1}{2}$ of $\frac{3}{5}$ to a proper Fraction. *Anſ.* $\frac{6}{30} = \frac{1}{5}$.
Reduce $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{4}{5}$ to a proper Fraction. *Anſ.* $\frac{24}{120} = \frac{1}{5}$.

CASE 4.

To reduce a Fraction to its loweſt Terms.

RULE. Take the *Half* of the Numerator and Denominator as often as you can; or otherwiſe divide them both by any Figure or Number that you can without any Remainder; and this laſt Quotient will be the loweſt Term of the Fraction given.

EXAMPLES.

Reduce $\frac{24}{96}$ to its loweſt Terms. *Anſ.* $\frac{1}{4}$.

Here I take the $\frac{1}{2}$ of both as long as I can, and find it is $\frac{3}{4}$: Or I divide both by 12, and then it will be $\frac{2}{8} = \frac{1}{4}$, its loweſt Term.

Reduce

Reduce $\frac{14}{70}$ to its loweſt Terms. *Anſ.* $\frac{1}{5}$.

Firſt I divide them both by 2, which gives $\frac{7}{35}$, and then this by 7 gives $\frac{1}{5}$, the Anſwer.

Reduce $\frac{72}{264}$ to its loweſt Terms. *Anſ.* $\frac{3}{11}$.

Reduce $\frac{945}{1575}\frac{0}{0}$ to its loweſt Terms. *Anſ.* $\frac{3}{5}$.

N. B. There is a Method to find a common Meaſurer, or one Diviſor, which will bring a Fraction to its loweſt Term at one Work or Diviſion; but that will take more Time to find than the Work itſelf may be performed in, therefore I would not chooſe to puzzle the Learner with unneceſſary Niceties.

CASE 5.

To reduce Fractions of different Denominators, to Fractions equal to them, having one common Denominator to all.

RULE. Multiply all the Denominators together for a common Denominator; then begin with the Numerator of the firſt Fraction, and multiply it into every Denominator, (except its own Denominator;) do the ſame with all the other Numerators; then place theſe different Products over the common Denominator, and your Fractions will be equal to the given Fractions.

EXAMPLES.

Reduce $\frac{2}{5}$, $\frac{3}{4}$, and $\frac{5}{8}$, to Fractions having a common Denominator of equal Value.

Here obſerve, that $5 \times 4 \times 8 = 160$, the common Denominator.

Then, $2 \times 4 \times 8 = 64$, for one new Numerator,

Then, $3 \times 5 \times 8 = 120$, a new Numerator, and

Laſtly, $5 \times 4 \times 5 = 100$, a new Numerator: So that the Anſwer is $\frac{64}{160} = \frac{2}{5}$, $\frac{120}{160} = \frac{3}{4}$, and $\frac{100}{160} = \frac{5}{8}$.

Reduce $\frac{4}{5}$, $\frac{3}{12}$, and $\frac{7}{8}$, to Fractions having a common Denominator. *Anſ.* $\frac{384}{480}$, $\frac{420}{480}$, and $\frac{440}{480}$.

CASE 6.

To reduce Fractions of one Name or Denomination to another.

This is either aſcending or deſcending.

1. ASCENDING.

RULE. When a Fraction of a ſmall, is to be brought into another of a greater Denomination, make of it a compound Fraction, by ſetting the Parts contained in every aſcending

aſcending Integer underneath for Denominators, and Unity over them for Numerators; then multiply all the Numerators together for a new Numerator, and all the Denominators together for a new Denominator, ſo ſhall this Fraction of the laſt Name be equal to the given Fraction of the firſt Name.

EXAMPLES.

Reduce $\frac{1}{4}$ of a Penny to the Fraction of a Pound Sterling. *Anſ.* $\frac{1}{960}$ of a Pound.

Thus $\frac{1}{4}$ of $\frac{1}{12}$ of $\frac{1}{20} = \frac{1}{960}$, that is, $\frac{1}{4}$ of a Penny is $= \frac{1}{960}$ of a Pound $=$ 1 Farthing.

Reduce $\frac{3}{4}$ of a Farthing to the Fraction of a Guinea. *Anſ.* $\frac{3}{4032}$.

Reduce $\frac{1}{4}$ of a lb. to the Fraction of a Ton. *Anſ.* $\frac{1}{8960}$.

2. DESCENDING.

This is quite the Reverſe of the former; for though you muſt make a compound Fraction of the Parts of the Integer as before, yet thoſe Parts muſt now be made Numerators, and Unity Denominators to them: Then reduce them to a *ſimple* or *proper* Fraction, and you have the Anſwer.

EXAMPLES.

Reduce $\frac{1}{960}$ of a Pound Sterling to the Fraction of a Penny. *Anſ.* $\frac{1}{4}$.

For $\frac{20}{1}$ of $\frac{12}{1}$ of $\frac{4}{1} = \frac{960}{1}$.

Reduce $\frac{3}{4032}$ of a Guinea to the Fraction of a Farthing. *Anſ.*

Reduce $\frac{1}{8960}$ of a Ton to the Fraction of a lb. *Anſ.*

CASE 7.

To find the Value of a Vulgar Fraction in Money, Weight, or Meaſure.

N. B. This being the moſt uſeful Caſe in Reſpect of knowing the Value of any Fraction when compared with Unity, the young Tyro cannot be too much inſtructed in its Uſe and Practice.

RULE.

RULE. Multiply the Numerator by the next leſs inferior Part to the Integer itſelf, and divide by the Denominator, and the Quotient will be the Anſwer in the Name of that Part; then multiply the Remainder by the next inferior Part, and divide by the ſame; and ſo proceed till you can reduce the Fraction no lower; ſo ſhall the ſeveral Quotients be the Anſwer in their next inferior Order.

Sch. This Rule is very intricate to me at preſent, I wiſh you would give me one Example at large as before.

Maſt. I will.

What is the Value of $\frac{14}{25}$ of a Pound Sterling?

14
20

25)280(11*s.*
25

30
25

5
12

25)60(2*d.*
50

10
4

25)40(1*qr.*
25

15

Anſ. 11*s.* 2*d.* $\frac{1}{4}$ $\frac{15}{25}$ or $\frac{3}{5}$ of a Farthing.

Here you ſee the Proceſs is ſo plain, that let it be Money, Weight, or Meaſure, you cannot fail to have an Anſwer, if you duly attend to the Work.

EXAMPLES *for Trial.*

What is the Value of $\frac{4}{28}\frac{1}{7}$ of a Pound? *Anſ.* 2*s.* 10*d.* $\frac{1}{4}$ $\frac{4}{28}\frac{1}{7}$ or $\frac{1}{7}$.

What is the Value of $\frac{1}{5}\frac{1}{5}$ of a Moidore? *Anſ.* 5*s.* 4*d.* $\frac{3}{4}$ $\frac{11}{55}$ or $\frac{1}{5}$.

What is the Value of $\frac{14}{120}$ of a Hundred-weight? *Anſ.* 12lb. 7oz. 1dr. $\frac{28}{120}$ or $\frac{7}{9}$.

What

What is the Value of $\frac{4}{44}$ of a Pound Troy? *Anſ.* 1 oz. 1 dwt. 19 gr, $\frac{28}{44}$ or $\frac{7}{11}$

What is the Value of $\frac{13}{56}$ of a Hogſhead of Wine? *Anſ.* 13 Gallons.

What is the Value of $\frac{14}{54}$ of a Mile? *Anſ.* 160 Yards.

What is the Value of $\frac{146}{552}$ of a Year? *Anſ.* 96 Days 12 H. 57 M. 23 Sec. $\frac{240}{552}$.

II. ADDITION *of* VULGAR FRACTIONS.

Sch. How is Addition *performed?*

Maſt. If you are perfect in the foregoing Caſes in *Reduction*, you will ſoon do all the other Rules.

CASE 1.

When the Fractions have one common Denominator, then only add all the Numerators together, and place them over the common Denominator; and if it be an Improper Fraction reduce it to a Mixed Number.

Add $\frac{2}{14}$, $\frac{3}{14}$, and $\frac{7}{14}$, together. *Anſ.* $\frac{12}{14} = \frac{6}{7}$.

Add $\frac{4}{7}$, $\frac{1}{7}$, $\frac{6}{7}$, $\frac{5}{7}$, and $\frac{3}{7}$, together. *Anſ.* $\frac{19}{7} = 2\frac{5}{7}$.

Add $\frac{144}{246}$, $\frac{147}{246}$, $\frac{39}{246}$, and $\frac{217}{246}$, together. *Anſ.* $\frac{547}{246} = 2\frac{55}{246}$.

CASE 2.

When the Fractions have not a common Denominator, reduce them to one, and then add the Numerators together as before directed.

Add $\frac{3}{4}$ and $\frac{4}{5}$ together. *Anſ.* $\frac{31}{20} = 1\frac{11}{20}$.

Firſt, $\frac{3}{4}$ and $\frac{4}{5}$ reduced are $= \frac{15}{20}$ and $\frac{16}{20} = \frac{31}{20} = 1\frac{11}{20}$.

Add $\frac{3}{4}$, $\frac{4}{5}$, and $\frac{5}{6}$, together. *Anſ.* $2\frac{46}{120}$.

Add $\frac{4}{11}$, $\frac{3}{7}$, and $\frac{5}{12}$, together. *Anſ.* $1\frac{193}{924}$.

CASE 3.

When the Fractions to be added are *Compound*, then reduce them to *Simple* ones, and after this to a common Denominator; and if there be any other Fractions mixed with the Compound ones, let them alone till you have firſt reduced thoſe that are Compound, and then proceed with all of them as before directed.

Add

Add $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{7}{8}$ and $\frac{3}{5}$ of $\frac{5}{7}$ together.

Firſt $\frac{2}{3}$ of $\frac{3}{4}$ of $\frac{7}{8} = \frac{42}{96}$, and $\frac{2}{5}$ of $\frac{5}{7} = \frac{10}{35}$; then it is thus read, Add $\frac{42}{96}$ and $\frac{10}{35}$ together, and if you abbreviate the Fractions, it is, Add $\frac{7}{16}$ and $\frac{2}{7}$ together. *Anſ.* $\frac{49}{112}$ and $\frac{32}{112} = \frac{81}{112}$.

Add $\frac{4}{11}$ of $\frac{3}{5}$ and $\frac{5}{8}$ of $\frac{3}{7}$ and $\frac{5}{9}$ together. That is, add $\frac{12}{55}$, $\frac{15}{56}$, and $\frac{5}{9}$, together. *Anſ.* $1\frac{11753}{27720}$.

CASE 4.

When there are Mixed Numbers, then let the whole Numbers alone till you have reduced the Fractions to a common Denominator, then add the Numerators as before, and, if Occaſion requires, carry 1 more to the whole Numbers as in common Addition.

Add $41\frac{7}{19}$ and $27\frac{5}{19}$ together. *Anſ.* $68\frac{12}{19}$.
Add $517\frac{2}{5}$ and $41\frac{3}{4}$ together. *Anſ.* $559\frac{3}{20}$.
Add $4\frac{2}{5}$, $7\frac{1}{2}$ of $\frac{2}{3}$, $25\frac{2}{7}$, and $\frac{3}{5}$, together. *Anſ.* $37\frac{650}{1050}$.

III. SUBTRACTION *of* VULGAR FRACTIONS.

Sch. How is this performed?

Maſt. All Fractions muſt be reduced to Simple ones, and all to a common Denominator; then ſubtract the lower from the Top Numerator, and place the Difference over the common Denominator.

From $\frac{4}{9}$ take $\frac{1}{9}$. *Anſ.* $\frac{3}{9}$.
From $17\frac{4}{2}$ take $7\frac{5}{2}$. *Anſ.* $7\frac{9}{2}$.

But obſerve,

If the Numerator of the lower or under Fraction be larger than the Numerator of the Top Fraction, then you muſt ſubtract the lower Numerator out of the common Denominator, and take in or add the Numerator of the Top Fraction beſides (as you do in common Subtraction when you borrow,) and remember to carry 1 for ſo doing to the lower whole Number, and then take it of the Top whole Number.

From

From $4\frac{2}{7}$ take $2\frac{4}{7}$. *Anſ.* $1\frac{5}{7}$. Now to prove this, add $1\frac{5}{7}$ the Difference to $2\frac{4}{7}$ the leſs Number, and their Sum is $= 4\frac{2}{7}$, the greater Number.

From $471\frac{1}{27}$ take $305\frac{19}{27}$. *Anſ.* $165\frac{22}{27}$.

EXAMPLE *with the Proof.*

A Merchant owes his Correſpondent $415l.\frac{1}{3}$ Sterling, and he remitted to him on Account $345\frac{7}{8}$ Sterling; what is there ſtill due to Balance? *Anſ.* $169l.\frac{11}{24}$, *viz.* $169l.$ $9s.$ $2d.$ — Now to prove this, $415l.\frac{1}{3}$ is $415l.$ $6s.$ $8d.$ and $345l.\frac{7}{8}$ is $345l.$ $17s.$ $6d$, which taken from $415l.$ $6s.$ $8d.$ leaves $169l.$ $9s.$ $2d.$ $= 169\frac{11}{24}$.

Sch. I heartily thank you, Sir.

Maſt. Pray do not make Uſe of this as a common Compliment, but let me ſee your Deſire is to underſtand what I have ſhewn you.

Sch. Depend upon it, Sir, I will do my beſt.

Maſt. Then we proceed to a very eaſy Rule.

IV. MULTIPLICATION *of* VULGAR FRACTIONS.

Sch. How am I to proceed here?

Maſt. Reduce only Compound Fractions to Simple ones, for let the Fractions be of any other Denomination whatever, the Rule is —

[RULE.] Multiply the Numerators together for a new Numerator, and the Denominators together for a new Denominator.

EXAMPLES.

Multiply $\frac{4}{7}$ by $\frac{2}{5}$. *Anſ.* $\frac{8}{35}$.
Multiply $\frac{5}{9}$ by $\frac{3}{7}$. *Anſ.* $\frac{15}{63} = \frac{5}{21}$.
Multiply $\frac{14}{94}$ by $\frac{7}{12}$. *Anſ.* $\frac{98}{1128}$.
Multiply $\frac{2}{3}$ of $\frac{1}{4}$ by $\frac{3}{5}$. *Anſ.* $\frac{6}{60} = \frac{1}{10}$.
Multiply $\frac{3}{5}$ of $\frac{5}{8}$ by $\frac{2}{3}$ of $\frac{1}{4}$. *Anſ.* $\frac{30}{480}$ or $\frac{3}{48} = \frac{1}{16}$.

CASE

CASE 2.

When the Fractions are improper, they are ſtill multiplied in the ſame Manner as in Caſe 1. and if there be mixed Numbers, reduce them to improper Fractions, and proceed as before; and if the Anſwer at laſt be an improper Fraction, reduce it to a mixt Number.

EXAMPLES.

Multiply $\frac{42}{4}$ by $\frac{3}{5}$. *Anſ.* $\frac{126}{20} = 6\frac{6}{20} = 6\frac{3}{10}$.
Multiply $\frac{247}{5}$ by $\frac{5}{8}$. *Anſ.* $\frac{1235}{40} = 30\frac{35}{40} = 30\frac{7}{8}$.
Multiply $14\frac{5}{6}$ by $3\frac{1}{4}$. Theſe reduced to improper Fractions, it will be, Multiply $\frac{89}{6}$ by $\frac{13}{4}$. *Anſ.* $\frac{1157}{24} = 48\frac{5}{24}$.

PRACTICAL QUESTIONS *in* MONEY.

Theſe are performed the ſame as before, and then reduce the fractional Part by finding its Value, and you will have an Anſwer as in common Arithmetic.

EXAMPLES.

Multiply 4 Pence Halfpenny, by 4 Pence Halfpenny, *viz.* $4\frac{1}{2} \times 4\frac{1}{2}$; this reduced to an improper Fraction, is
Multiply $\frac{9}{2}$ by $\frac{9}{2}$. *Anſ.* $\frac{81}{4} = 20\frac{1}{4}$, that is $= 20d.\ \frac{1}{4}$.
Multiply $\frac{1}{2}$ a Crown by $\frac{1}{2}$ a Crown, or 2*s.* 6*d.* by 2*s.* 6*d.* *Anſ.* 6*s.* 3*d.*

Thus 2*s.* 6*d.* reduced to Pence, is 30. Therefore, multiply $\frac{30}{12}$ by $\frac{30}{12}$. *Anſ.* $\frac{900}{144} = 6\frac{36}{144} = \frac{1}{4}$, *viz.* 6*s.* 3*d.* Or for Practice Sake, and in a more maſterly Manner, conſider my little Pupil, that 6 Pence is the $\frac{1}{2}$ of a Shilling, therefore,

The ſame another Way.

Multiply $2\frac{1}{2}$ by $2\frac{1}{2}$, *viz.* $\frac{5}{2}$ by $\frac{5}{2}$, this is $\frac{25}{4} = 6\frac{1}{4}$ as before, and much ſhorter.

Sch. I am highly obliged to you indeed, and I think I can now anſwer that famous Queſtion which I have heard ſo often propoſed to a great many Perſons who have pretended to underſtand Vulgar and Decimal Fractions very well.

Maſt. What is that pray?

Sch. It is this.

Multiply 3*l.* 19*s.* 11*d.* $\frac{3}{4}$ by 3*l.* 19*s.* 11*d.* $\frac{3}{4}$.

Maſt. Pray how will you go about it?

Sch. I firſt reduce the Money to Farthings, and make an improper Fraction of them; then multiply Numerators and Denominators together; then reduce the Anſwer into a mixt Number, and find the Value of the remaining Fraction.—Is this the Way?

Maſt. Multiply 3*l.* 19*s.* 11*d.* $\frac{3}{4}$ by 3*l.* 19*s.* 11*d.* $\frac{3}{4}$, will be, multiply $\frac{3839}{960}$ by $\frac{3839}{960}$. *Anſ* $\frac{14737921}{921600} = 15l.$ 19*s.* 10*d.* $\frac{240}{921600}$ or $\frac{960}{921600}$ of a Farthing, which you may prove at Leiſure.

V. DIVISION *of* VULGAR FRACTIONS.

Sch. How is this performed?

Maſt. By the following

[RULE.] Multiply the Numerator of the Dividend, by the Denominator of the Diviſor, and reſerve it for a new Numerator; then multiply the Denominator of the Dividend, into the Numerator of the Diviſor, for a new Denominator, ſo ſhall this new Fraction be the proper Quotient or Anſwer.

EXAMPLES **.

Divide $\frac{3}{4}$ by $\frac{2}{3}$. *Anſ.* $\frac{9}{8} = 1\ \frac{1}{8}$.

Divide $\frac{1}{2}$ by $\frac{7}{8}$. *Anſ.* $\frac{8}{14} = \frac{4}{7}$.

Divide $\frac{12}{14}$ by $\frac{3}{5}$. *Anſ.* $\frac{60}{42} = 1\ \frac{18}{42} = \frac{3}{7}$.

Divide $2\frac{14}{12}$ by $\frac{5}{8}$. *Anſ.* $\frac{1712}{60} = 28\ \frac{32}{60} = \frac{8}{15}$.

Divide $\frac{2}{4}$ of $\frac{1}{3}$ by $\frac{1}{5}$ of $\frac{3}{4}$. *Anſ.* $\frac{40}{36}$ * $= \frac{10}{9} = 1\ \frac{1}{9}$.

* Here I abbreviate the improper Fraction firſt of all, *viz.* $\frac{40}{36} = \frac{10}{9}$, and ſo the Anſwer will be the eaſier found, and the Fraction after the mixt Number will be alſo leſs.

*** N. B.* There is another Way to do Diviſion, and that is, invert the Figures of the Fraction of the Diviſor, and then multiply Numerators and Denominators together. Thus, Example 1. $\frac{3}{4} \div \frac{2}{3}$ will be $\frac{3}{4} \times \frac{3}{2} = \frac{9}{8}$ as before.

PRACTICAL EXAMPLES *in* MONEY.

Divide 4*l.* by $\frac{1}{4}$, that is, divide $\frac{4}{1}$ by $\frac{1}{4}$. *Anſ.* $\frac{16}{1}$ = 16*l.* *.

* ☞ You are here to take particular Notice that every Quantity multiplied by leſs than Unity, decreaſes the Value in Anſwer; but any whole Number or Quantity divided by a Fraction or leſs than Unity, increaſes its Value ſo much more as the Quantity is leſs than Unity; thus 4*l.* as above divided by $\frac{1}{4}$, or 4 Times leſs than Unity, gives 4 Times as much for the Anſwer as the Dividend itſelf is, *viz* 16*l.* But if 4*l.* be multiplied by $\frac{1}{4}$, it decreaſes the Multiplicand 4 Times, *viz.* $\frac{4}{1} \times \frac{1}{4} = \frac{4}{4} = 1l.$ only.

Divide 6*s.* 3*d.* by $\frac{1}{2}$ a Crown. That is, divide $\frac{75}{12}$ by $\frac{30}{12}$. *Anſ.* $2\ \frac{1800}{3600}$ or $2\ \frac{1}{2}$, that is, 2*s.* 6*d.* *See the 2d Example in the practical Queſtions in* Multiplication; and the ſame for any other.

Divide 15*l.* 19*s.* 10*d.* $\frac{240}{9216}$ by 3*l.* 19*s.* 11*d.* $\frac{3}{4}$. *Anſ.* $3\frac{839}{960} = 3l.$ 19*s.* 11*d.* $\frac{3}{4}$.

VI. *The* RULE *of* THREE *in* VULGAR FRACTIONS.

Sch. I am afraid that this Rule is very hard.

Maſt. Why ſo, it is performed the very ſame as the ſingle *Rule* of Three *Direct*; for after having made your firſt and third Number of one Name, you multiply your ſecond by your third, and divide by the firſt.

EXAMPLES.

If $\frac{3}{4}$ of a Yard coſt $\frac{3}{8}$ of a Pound Sterling, what coſt $24\ \frac{1}{4}$ Yards? *Anſ.*

If $\frac{3}{4}$ —— $\frac{3}{8}$ —— $24\ \frac{1}{4}$, or $\frac{97}{4} \times \frac{3}{8} = \frac{291}{32}$, this $\div \frac{3}{4} = \frac{1164}{96}$. *Anſ.* = 12*l.* $\frac{12}{96}$ or $\frac{1}{8}$ = 12*l.* 2*s.* 6*d.*

Proof by common Arithmetic.

If 3 Quarters coſt 7*s.* 6*d.* what coſt 24 Yards 1 qr. *Anſ.* 12*l.* 2*s.* 6*d.* as before.

QUESTIONS *for* TRIAL.

If $\frac{3}{5}$ of a Yard coſt $\frac{1}{6}$ of a Pound, what muſt I give for $12\ \frac{1}{2}$ Yards? *Anſ.* 3*l.* 9*s.* 5*d.* $\frac{1}{4}$ $\frac{12}{360}$ or $\frac{1}{4}$.

If $2\frac{1}{2}$ Ells coſt $2\frac{3}{4}$ *l.* what coſt $28\frac{6}{7}$ Ells. *Anſ.* 31 *l.* $\frac{104}{140}$ = 31 *l.* 14 *s.* 10 *d.* $\frac{40}{140}$ or $\frac{2}{7}$.

If 1 Buſhel coſt $\frac{182}{960}$ *l.* what coſt 1 Load or 40 Buſhels? *Anſ.* 7 *l.* $\frac{560}{960} = \frac{7}{12} = 11$ *s.* 8 *d.*

At 7 *l.* $\frac{14}{24}$ per Load, what coſt 1 Buſhel. *Anſ.* $\frac{182}{960} = 3$ *s.* 9 *d.* $\frac{1}{2}$.

What is the Intereſt of 347 $\frac{5}{8}$ for 1 Year, at $4\frac{3}{8}$ per Cent. *Anſ.* 15 *l.* $\frac{13355}{64000}$ or 15 *l.* 4 *s.* 2 *d.* $\frac{400}{64000} = \frac{4}{64}$. See the Rule of Three in Decimals.

SECT. XV.

NOTATION *of* DECIMAL FRACTIONS.

Sch. *WHAT do you mean by a* Decimal Fraction?

Maſt. A Decimal, like a Vulgar Fraction, is a broken Number, or Part of an Integer, only with this Difference, that whereas a *Vulgar Fraction* has a Denominator, a Decimal never has; but the Denominator is conſidered; yet every *Vulgar Fraction* may be reduced or made equal to a *Decimal Fraction*; for in ſhort, every *Decimal* is but a Vulgar Fraction at beſt, as will appear by the following Obſervations.

OBSERVATION 1.

Every Decimal Fraction is known by having a Dot or Comma, ſet or placed before it; thus .5 .25 and .75; or .05 .025 .0075, *&c.* are Decimal Fractions: And theſe Decimals will have each for their reſpective Denominators, as follows, *viz.* .5 = $\frac{5}{10}$ or $\frac{1}{2}$; .25 = $\frac{25}{100}$ or $\frac{1}{4}$th, and .75 = $\frac{75}{100}$ or $\frac{3}{4}$ths: Alſo .05 = $\frac{05}{100}$; .025 = $\frac{025}{1000}$ and .0075 = $\frac{0075}{10000}$, by which you plainly ſee that the Denominator of every Decimal has as many Cyphers as there are Decimal Places, and 1 or Unity beſides. Therefore,

OBSERVATION 2.

Every Decimal is decreaſed 10 Times in Value, by having Cyphers placed on the left Hand of them; as every whole

whole Number is increaſed 10 Times by Cyphers on the right Hand —Thus .1 when made .01 is 10 Times leſs; and if .001, it will be 10 Times leſs than before, and 100 leſs than the firſt; for .1 is $\frac{1}{10}$; .01 = $\frac{01}{100}$, .001 = $\frac{001}{1000}$ Parts as before; this will be very eaſily underſtood by the following Table.

TABLE.

Whole Numbers.							Decimal Parts.						
7	6	5	4	3	2	1	.2	3	4	5	6	7	
													Parts of Millions
													Parts of Hundred Thouſands
													Parts of Ten Thouſands
													Parts of Thouſands
													Parts of Hundreds
													Parts of Tens
						Units							
						Tens							
						Hundreds							
						Thouſands							
						Tens of Thouſands							
						Hundreds of Thouſands							
						Millions							

OBSERVATION 3.

From the foregoing Table it will appear by Inſpection only, that from the Place of Units, every Figure to the left Hand increaſes; but thoſe to the right decreaſe by Tenths, *viz.* $\frac{2}{10}$th Parts, $\frac{23}{100}$ Parts, $\frac{234}{1000}$ Parts, $\frac{2345}{10000}$ Parts, *&c.* —Do you underſtand it?

Sch. I do very well.

Maſt. Then we will proceed to ſhew you how Decimals are formed from *Vulgar* Fractions, for by this you will ſee the Nature of the Proceſs, and the Relation or Quality they bear to each other.

I. *Of* REDUCTION *of* DECIMALS.

CASE 1.

To reduce a Vulgar Fraction *to a* Decimal.

RULE. Add Cyphers to the Numerator of the *Vulgar Fraction*, and divide by its Denominator, and prick or dot off ſo many Figures in Numbers as you added Cyphers; ſo ſhall you have a *Decimal* equal in Value to the *Vulgar Fraction* given.

EXAMPLES.

Reduce $\frac{5}{8}$, $\frac{7}{8}$, and $\frac{11}{12}$ to Decimals.

OPERATION.

8) 5.000		8) 7.000		12) 11.0000 †	
* .625	*Anſ.*	.875	*Anſ.*	.9166	*Anſ.*

* Here you ſee $\frac{625}{1000} = \frac{5}{8}$ for $\frac{1}{8}$ of 1000 = 125, therefore 125 × 5 = 625; alſo $\frac{875}{1000} = \frac{7}{8}$.

† *Note* 1. The third Example has a Remainder, but after 4 Places of Figures, no Remainder is regarded, for though 8 remains, it is but $\frac{8}{12}$ or $\frac{2}{3}$ of $\frac{1}{10000}$ Part.

Reduce $\frac{456}{1000}$ to a Decimal. *Anſ.* .456.
Reduce $\frac{18}{99}$ to a Decimal. *Anſ.* .1818.

Note 2. When the Quotient has not ſo many Decimal Places in it as you added Cyphers to the Numerator of the Fraction; then you muſt place one or more Cyphers before the Figures in the Quotient to have a proper Anſwer.

Reduce $\frac{5}{80}$ to a Decimal. *Anſ.* .0625.

Note 3. You will ſee by the firſt Example that $\frac{5}{8} = .625$, and here $\frac{5}{80} = .0625$, and therefore $\frac{5}{800} = .00625$, which decreaſe 10 Times.—This Note, well remembered, will make you Maſter of Diviſion of Decimals.

More

More EXAMPLES.

Reduce $\frac{18}{6300}$ to a Decimal. *Anſ.* .002857.
Reduce $\frac{864}{2016}$ to a Decimal. *Anſ.* .4285.

CASE 2.

To find the Value of a Decimal Fraction *either in Money, Weight, Time or Meaſure.*

RULE.

Multiply the given Decimal by the Number of the next inferior Parts contained in the Integer, and obſerve always to prick or dot off as many Decimal Parts as were in the given Decimal itſelf; then multiply by the Number of the next inferior Parts, and ſtill continue to prick off the ſame Number of Decimals: Thus proceed, and you will have the Value of the Decimal itſelf ſtanding towards the left Hand of the Dot, and the Parts thereof towards the right Hand.

EXAMPLES.

1. What is the Value of .5765 of a £. Sterling?

20

11.5300

12

6.3600

4

1.4400 *Anſ.* 11*s.* 6*d.* $\frac{1}{4}$

2. What is the Value of .0975 of a Guinea?

21

2.0475

12

0.5700

4

2.2800 *Anſ.* 2*s.* 0*d.* $\frac{1}{2}$

What is the Value of .725 of a Portugal Piece? *Anſ.* 26*s.* 1*d.* $\frac{2}{10}$.
What is the .375 of a Ton. *Anſ.* 7 cwt. 2qrs.
What is the .395 of a lb. Troy. *Anſ.* 4oz. 14dwt. 19gr.
What is the .475 of a Load? *Anſ.* 19 Buſhels.
What is the .825 of a Mile? *Anſ.* 1452 Yards.
What is the .2735 of a Year? *Anſ.* 99 Days, 19 Hours, 51 Minutes, 36 Seconds.

CASE

CASE 3.

To tell the Value of a Decimal in Shillings, Pence and Farthings, by Inſpection only.

RULE.

1. Double the firſt Decimal Figure, and theſe will be the Shillings; and if the 2d and 3d Figures, or the two next Figures together, do not exceed 24, count them all for ſo many Farthings; if they do not exceed 39, then count them ſo many Farthings, abating one Farthing; but if the next 2 Figures be between 39, and not exceeding 49, then count them for Farthings, abating two, which reduce to Pence.

2. But if the 2d Figure be five or above five, then after you have doubled the 1ſt Figure for the Shillings, allow one more Shilling for this, and what remains, carry to the 3d Figure, counting them Farthings as before directed.

CASE 4.

To reduce Pounds, Shillings, Pence and Farthings, to a Decimal.

RULE.

Add Cyphers to the Farthings, and divide by 4, then ſet the Pence before this Decimal, and divide by 12; and laſtly, ſet the Shillings before this laſt Quotient, and divide by 20, ſo ſhall this laſt Work be the Decimal equal to the given Value.

EXAMPLES.

Reduce 14*s.* 7*d.* $\frac{1}{4}$ to a Decimal. *Anſ.* .7352.

4)	1.0000		
12)	7,2500	12)	8.0000
2|0)	14,604|1	2|0)	17 666|6
	.7302 *Anſ.*		.8833

So alſo 17*s.* 8*d.* = .8833

Note, The ſame is to be obſerved for Weight and Meaſure.

Reduce

Reduce 7 cwt. 2 qrs. to a Decimal. *Anſ.* .375.
Reduce 4 oz. 14 dwts. 19 grs. to a Decimal. *Anſ.* .395.

III. ADDITION *of* DECIMALS.

Sch. How is this performed?
Maſt. By the following Rule.

RULE. If there be only Decimals, then ſet all the firſt Places one under the other, and let the ſecond and third Places range under each other, and if there be whole Numbers, ſet them by the Side of the Decimals, and then add theſe together as in whole Numbers.

EXAMPLES.

Add .1437	Add 4.71	Add 476.0375
.3219	2.194	1.9
.0064	.72	.241
.90456	.009	3.37
.000357	5.9232	.17653
Anſ. 1.076917	*Anſ.*	*Anſ*

Add .571, .0716 24.719 and 243.00175 together. *Anſ.* £ 266.36335 = 268. 7*s.* 3*d.*

A PRACTICAL QUESTION.

Add £ 4.175 .375 £ 41.905; £ 17.3175 .895 and £ 3.17595 together. *Anſ.* £ 67.84345 = 67*l.* 16*s.* 10*d.* ¼.

IV. SUBTRACTION of DECIMALS.

Sch. How is this performed?
Maſt. The ſame as common *Subtraction*, only mind to place the Decimals as before directed.

EXAMPLES.

From .7251	From 9.41	From 91.24
Take .07954	Take 1.97625	Take 30.00714
Anſ. .64556	*Anſ.* 7.43375	*Anſ.*

From

From £ 14.9235, Take £ .971. *Anſ.*
From £ 376.215, Take £ 174.00754. *Anſ.*

A PRACTICAL QUESTION.

Borrowed £ 475.765, and paid three Times, each £ 150.07145, what is the Balance? *Anſ.* £ 25.55065 = 25*l.* 11*s.*

V. MULTIPLICATION *of* DECIMALS.

Sch. How is this performed?
Maſt. The ſame as common *Multiplication*; for

RULE.

Multiply the two Numbers together, and then prick off as many Decimal Places in the Product as you find contained in the Multiplicand and Multiplier; and if there be fewer Decimals in the Product than are found in the Multiplicand and Multiplier, add a Cypher or Cyphers, to make up that Deficiency.

EXAMPLES.

Multiply	9.546	Mult.	9.546	Mult.	9.546
by	6	by	.6	by	.06
Anſ.	57.276	*Anſ.*	5.7276	*Anſ.*	.57276 *

* *Note,* Here you ſee the Figures in the Product, or Anſwer of all theſe Examples are alike. But yet the 2d Example is 10 Times leſs than the 1ſt; and the 3d ten Times leſs than the 2d.

More EXAMPLES.

Multiply .9546 by .06. *Anſ.* .057276.
Multiply 72.7219 by .0012. *Anſ.* .08726628.
Multiply 725.5 by 3.7. *Anſ.* 2684.35.
Multiply .0597 by .325. *Anſ.* .0194025.
Multiply 47.25 by .00075. *Anſ.* .0354375.

Multiply

Multiply 147.295 by 7.53. *Anſ.* 1109,13135.
Multiply 27.098 by 17.987. *Anſ.* 487.411726.

Of MONEY.

Multiply £ 3.756 by £ 2.575. *Anſ.*
Multiply 4. 5. by 4.5. *Anſ.* 20.25 †.

† *Note.* This laſt Queſtion may be of great Uſe, not only as an Example, but for the further Inſtruction and Improvement in the Nature of Decimals, acting different in Nomination, and yet the ſame in Relation to themſelves. As for Inſtance, £ 4.5 multiplied by 4 *l.* 5 *s.* = £ 20.25 = 20 *l.* 5 *s.* again 4 *s.* 6 *d.* × 4 *s.* 6 *d.* = 20.25 *s.* = 1 *l.* and 3 *d.* and 4 *d.* $\frac{1}{2}$ × 4 *d.* $\frac{1}{2}$ = 20. 25 *d.* = 20 *d.* $\frac{1}{4}$.—See theſe Examples in Vulgar Fractions.

An EXAMPLE *for* PRACTICE.

Multiply 3 *l.* 19 *s.* 11 *d.* $\frac{3}{4}$ by 3 *l* 19 *s.* 11 *d.* $\frac{3}{4}$; that is, multiply £ 3.98958 × £ 3.98958. *Anſ.* £ 15.916748576 4 = 15 *l.* 19 *s.* 10 *d.* very nearly.—See the ſame Queſtion in *Multiplication* of *Vulgar Fractions.*

V. DIVISION *of* DECIMALS.

Sch. I ſuppoſe, Sir, that Diviſion *in this Rule is very hard?*
Maſt. You are to ſuppoſe nothing hard to diſcourage yourſelf in your Purſuit of Learning, nor diſcourage me in the teaching of you.—Do you but carefully obſerve the Rule, and you cannot miſs doing it; and if you cannot underſtand it, aſk me, or your Inſtructor; and not ſit ſtupifying yourſelf to no Purpoſe, nor trifling away your Time contrary to the Deſign of your intended Education.
Sch. I ſhall take Care Sir to be as diligent as I can.
Maſt. Obſerve then the following Rule.

RULE.

Divide one Number by the other as in common Diviſion, and then obſerve how many Decimal Places you have in the Dividend, and ſubtract the Decimal Places of the Diviſor, out of the Decimal Places of the Dividend, and prick

prick or dot off ſo many Places in the Quotient, and that is the Anſwer required.

Here follow three Examples different in Anſwer, yet the Operation of all are alike.

6.)57.276	by .6)57.276	by .06)57.276
Anſ. 9.546	*Anſ.* 95.46	*Anſ.* 954.6

Note 1. Here you plainly ſee I ſubtract the Decimals of the Diviſor, out of the Decimals belonging to the Dividend, and dot off the Remainder; and as there are no Decimals in Example 1. but 6 being a whole Number, therefore the Quotient will have 3 Decimal Places as well as the Dividend.

Note 2. Obſerve alſo that in the 2d Example, the Diviſor is 10 Times leſs than in the firſt; therefore the Quotient or Anſwer is 10 Times more than in the firſt Example, and the Diviſor of the third Example is 10 Times leſs than the ſecond Example; therefore the Anſwer is 10 Times as much. See Example 1, 2, and 3, in Multiplication.

Note 3. When the Diviſor has more Figures than the Dividend, then add Cyphers to the Dividend, and proceed as before.

EXAMPLES.

Divide 56.304 by 18.4. *Anſ.* 3.06.
Divide 56.304 by 1.84. *Anſ.* 30.6.
Divide 172.5 by 3.746. *Anſ.* 46.049.
Divide 73.486138 by 1.30526. *Anſ.* 56.3.
Divide 73.486138 by 130.526. *Anſ.* .563.
Divide 1.725 by 374.6, and have a Decimal of ſeven Places. *Anſ.* .0049626.

Here you muſt add Cyphers to the Dividend 1.725 thus 1.72500008, and you will find the Anſwer to be according to common Diviſion .49626; but there being 8 Decimal Places in the Dividend, and but 1 in the Diviſor, the Difference is 7 Places; but as there are but five Places in the Quotient, I therefore place two Cyphers before them to ſupply that Defect, and find the Anſwer to be .0049626.

SECT.

SECT. XVI.

The RULE of THREE DIRECT in DECIMALS.

Sch. HOW *is this performed?*

Maſt. The ſame as the common Rule of Three Direct, by making the 1ſt and 3d Number both of a Number, *&c.*

EXAMPLES.

1. If .75 of a Yard, coſt .25 of a Pound; what coſt 176.5. *Anſ.* £58.833 = 58*l.* 16*s.* 8*d.*

PROOF.

.75 = $\frac{3}{4}$ or 3 Quarters .25 = $\frac{1}{4}$ or 1 Quarter and 176.5 = 176 $\frac{1}{2}$ or 176.2 qrs.

Then, If 3 qrs. coſt 5*s.* what coſt 176.2 qrs. yds. *Anſ.* 58*l.* 16*s.* 8*d.* as above.

2. Bought 340 $\frac{1}{8}$ yds. of Cloth, which coſt me £94 $\frac{7}{11}$, what did it coſt per Yard?

Say, If 340.125 yds. —— £94.636 —— 1 yd. *Anſ.*

3. What's the Intereſt of 347 $\frac{5}{8}$ for 2 $\frac{3}{4}$ Year, at 4 $\frac{3}{8}$ per Cent. *Anſ.* £15.20859375 = 15*l.* 4*s.* 2*d.*

Sch. I thank you Sir, and pray what other Rules are there?

Maſt. Cuſtom has made ſeveral other *Nominal* Rules; but moſt of them may be performed either by the Rule of Three, or *Practice*; ſuch as *Loſs* and *Gain*, *Barter*, *Equation* of Payments, *Brokerage*, *Inſurances* or *Aſſurances*, *Intereſt* ſimple and compound, *Diſcount Exchange*, *Alligation* Medial and Alternate, *Permutation* of Numbers, *Fellowſhip* or *Partnerſhip*, with or without *Time*, Rules of *Falſe Progreſſion.*

SECT. XVII.

LOSS *and* GAIN.

Sch. WHAT does this Rule teach?

Maſt. The Profits and Loſs of Trade in buying and ſelling different Commodities, and is, as I ſaid before, but the Rule of Three at beſt.

EXAMPLES.

1. A Linnen-Draper bought 40 Pieces of Iriſh, each containing 24 Yards, for which he gave 115 Guineas; and ſold the Whole Retail at 2*s.* 9*d.* per Yard; what did he gain or loſe? *Anſ.* He gained 11*l.* 5*s.*

2. What is gained per Cent. (that is in laying out 100*l.*) if one Shilling brings me in 14*d.* ½. *Anſ.* 20*l.* 16*s.* 8*d.*

3. A Wine Merchant bought 7 Hhds of Wine (63 Gallons each) which coſt him 147*l.* he ſold 2 Hhds. for 38*l.* 10*s.* and one Hhd. for 20 Guineas, but one Hhd. leaked out 35 Gallons, and the Remainder he ſold out for 8*s.* 6*d.* per Gallon; what did he gain or loſe? *Anſ.* He gained 4*l.* 14*s.* 6*d.*

See two more Examples of this Sort in the Rule of Three Direct. Queſtion the 25th and 31ſt.

SECT. XVIII.

Of BARTER.

Sch. WHAT ſignifies the Word Barter, *and what is the Uſe of this Rule?*

Maſt. *Barter* ſignifies *Truck*; or it is the *Bartering* or *Exchanging* one Commodity for another, ſo that neither of the Parties ſo *Bartering* may be a Loſer.

EXAMPLES

EXAMPLES.

A and B, barter; A has 50 Pieces of Iriſh, worth one with another, 2*l* 15*s*. 6*d*. per Piece: B has Tea worth 8*s*. 4*d*. per lb. what Quantity of Tea muſt B let A have to balance the Debt of the Iriſh? *Anſ.* 333 lb. or 2 cwt. 3 qrs. 25 lb.

2. Two Merchants, A and B barter, A has Sugar worth 4*l*. per Cwt. ready Money, but in Barter he will have 4*l*. 5*s*. per Cwt. B has French Wine worth 45*l*. per Pipe; how much muſt he advance his Wine to equal the advance of A's Sugar in Barter? *Anſ.* He muſt advance his Wine 2*l*. 16*s*. 3*d*. ſo that the Wine will be worth 47*l*. 16*s*. 3*d*. per Pipe.

SECT. XIX.

EQUATION *of* PAYMENTS.

Sch. WHAT do you mean by this Rule?

Maſt. It teaches us to find a mean Time for the Payment of various Sums due at different Times, and to pay the Whole at one Payment at a certain Time to come, ſo that neither the Debtor or Creditor may be a Sufferer; but this Rule, like *Rebate*, is done or wrought by Cuſtom rather than Truth.

Sch. What is the Rule?

Maſt. The *common* Method is,

Multiply each Payment by the Time in Months or Weeks, in which they are to be paid in; then add all theſe Products together, and divide the Sum by the whole Debt, and the Quotient gives the proper or equated Time.

EXAMPLES.

1. A owes B 400*l*. and agreed to pay him 150*l*. in four Months, and the remaining 250*l*. in 6 Months; but they at laſt agreed to reduce the Whole to one Payment; I demand the Time. *Anſ.* 5 ¼ Months.

2. B borrowed of A 400*l.* of which 250*l.* was to be paid in 4 Months, and 150*l.* in 6 Months; but they agreed to make the Diſcharge by one Payment; I demand the Time. *Anſ.* 4 $\frac{3}{4}$ Months.

3. A Perſon borrowed of his Friend 840*l.* for three Months; but receiving ſome Money on the ſame Day, remitted to him 120*l.* I demand the equated Time he ought to pay it in, or how much longer he ought to have allowed him to pay the Remainder? *Anſ.* 3 $\frac{1}{2}$ Months. So that by paying this 120*l.* down, he has 2 Weeks longer allowed him *.

SECT. XX.

Of SIMPLE INTEREST, BROKERAGE, *and* ASSURANCES.

I. *Of* SIMPLE INTEREST.

Sch. *WHAT do you mean by* Intereſt?

Maſt. It is an Allowance of ſo much per Cent. from the Borrower to the Lender, as a Favour done to

* This is the *common* Method, but it is not a true one, though *Wingate*, *Cocker*, *Ayres*, *Hill*, *Stonehouſe*, *Dilworth* and others uſe it, and have taken no Notice of the right Method; but perhaps it might be becauſe this Method is very eaſy, moſt natural to Practice, and as near enough to Truth, or common Practice, it may be uſed without much Injury to the Parties: But the true Method is,

Let P be put for the firſt Payment, and T the Time to pay it in; and let P repreſent the next Payment, and t the true Time. Alſo put r for the Intereſt of 1*l.* for a Year; then $a = t + T + \frac{pP}{Pr}$, and $c = tT + \frac{pt + PT}{Pr}$; then $\frac{a + \sqrt{a^2 - 4c}}{2}$ is the true equated Time of the firſt 2 Payments, and thus may any other Payment be found. See *Malcolm*'s Treatiſe of Arithmetic.

him

him in making Uſe of the Money lent him for a certain Time agreed upon.

Sch. How is this performed?

Maſt. It may be performed by the Rule of Three Direct, as I ſaid before.—See Queſtion the 27th and 28th in that Rule; but there is a ſhort Way by Practice, and much eaſier, as follows.

CASE I.

When the Rate per Cent. is Pounds, then multiply the given Sum by the Rate per Cent and cut off the firſt 2 Figures towards the right Hand, that is in the Units and Tens Place (which is the ſame as dividing by 100) and the Figures towards the left Hand ſo cut off, will be the Intereſt of that Sum in Pounds for one Year; then multiply the two Figures you cut off by 20, and take in the Shillings, and cut off two Figures as before, and the left Hand will give the Shillings; then multiply the Remainder by 12, and by 4, taking in the odd Pence and Farthings, and cut off as before, you have the Pence and Farthings.

EXAMPLES.

What is the Intereſt of 475 *l.* 12 *s.* 6 *d.* for one Year, at 5 *l.* per Cent. per Annum?

475 12 6
5

l. 23 | 78 2 6
20

s. 15 | 12
12

d. 7 | 50
4

qrs. 2 | 00

Anſ. 23 *l.* 15 *s.* 7 *d.* ½

2. What's the Intereſt of 1765 *l.* 10 *s.* for 1 Year, at 4 *l.* per Cent. *Anſ.* 70 *l.* 12 *s.* 4 *d.* ¾.

3. A borrowed of B 1560*l.* at 4*l.* per Cent. per Annum, and paid 2 Years Intereſt for it very punctual; but A took no Care to call upon B; nor did B take Notice to pay any more Intereſt: Now A died exactly 9 Years after he had lent B the Money, and in his Will left to his eldeſt Son the whole Principal, and all Intereſt due upon it; I demand what Intereſt was due, and what was the Son's Fortune. *Anſ.* The Intereſt due was 436*l.* 16*s.* and the whole Fortune 1996*l.* 16*s.*

CASE 2.

When the Intereſt is for Years and Months, then find the Intereſt for one Year, and take the Parts for the Months, out of one Year's Intereſt, and add all the Sums together.

4. What is the Intereſt of 1765*l.* 10*s.* for 4 Years, 9 Months, at 5*l.* per Cent. per Annum. *Anſ.* 419*l.* 6*s.* 1*d.* $\frac{1}{2}$. For the Intereſt for one Year, is 88*l.* 5*s.* 6*d.* this × 4 = 353*l.* 2*s.* for four Years; then for the odd 9 Months, ſay 6 Months is $\frac{1}{2}$ of a Year, and take the $\frac{1}{2}$ of 88*l.* 5*s.* 6*d.* which is 44*l.* 2*s.* 9*d.* then for the other 3 Months, take the $\frac{1}{2}$ of 44*l.* 2*s.* 6*d.* which is 22*l.* 1*s.* 9*d.* Add theſe 3 Sums together, you will find the Anſwer 419*l.* 6*s.* 1*d.* $\frac{1}{2}$.

CASE 3.

When the Intereſt is for any Time leſs than a Year, find it firſt for a Year, and then take the Parts of one Year's Intereſt for the given Time.

EXAMPLE.

What is the Intereſt of 478*l.* 15*s.* for 4 Months, at 5*l.* per Cent. per Annum? *Anſ.* 7*l.* 19*s.* 7*d.* For 1 Year is, 23*l.* 18*s.* 9*d.* and 4 Months is $\frac{1}{3}$ of a Year; therefore the 3d Part of 23*l.* 18*s.* 9*d.* is 7*l.* 19*s.* 7*d.*

CASE 4.

II. INTEREST for DAYS.

RULE.

Bring the Principal into Pence, and multiply them by the Number of Days, and this Product by the Rate per Cent.

Cent. and it ſhall be a Dividend; then multiply 365 by 100, and it ſhall be a Diviſor, and the Quotient ſhall be the Anſwer in Pence.

EXAMPLES.

6. What is the Intereſt of 240*l.* for 126 Days, at 4*l.* per Cent. *Anſ.* 795 Pence $\frac{146}{365}$, *viz.* 3*l.* 6*s.* 3*d.* $\frac{129}{365}$.

7. What is the Intereſt of 480*l.* for 120 Days, at 4*l.* per Cent. *Anſ.* 6*l.* 6*s.* 2*d.* $\frac{3}{4}$. $\frac{305}{365}$.

CASE 5.

Having the Rate per Cent. the Intereſt and Time given to find the Principal.

RULE.

As the Amount or Intereſt of 100*l.* at the Rate and Time given is to 100*l.* ſo is the given Intereſt or Amount, to the Principal required. Or multiply the Years by the Rate per Cent. to which add 100, and this is your firſt Number; then make 100 your ſecond Number, and the given Amount your third Number.

EXAMPLES.

8. What Principal being put to Intereſt, at 5*l.* per Cent. will in one Year amount to 23*l.* 15*s.* 7*d.* $\frac{1}{2}$? *Anſ.* 475*l.* 12*s.* 6*d.*

9. A Perſon had a certain Sum of Money, which was put out at the Rate of 5*l.* per Cent. and when it had continued 4 Years, 9 Months, he received for Intereſt, 419*l.* 6*s.* 1*d.* $\frac{1}{2}$; I demand the Principal. *Anſ.* 1765*l.* 10*s.*

CASE 6.

Having the Principal, Intereſt, and Rate per Cent. to tell the Time.

RULE.

Firſt, Find the Intereſt for one Year; then by the Rule of Three, ſay, As 1 Year's Intereſt, is to 1 Year, ſo is the Intereſt upon the Whole for the whole Time, to the Time required.

EXAMPLE

EXAMPLES.

10. A Perſon put into the Stocks 1765*l.* 10*s.* at 5*l.* per Cent. and it lay ſo long that the Intereſt amounted to 419*l.* 6*s.* 1*d.* ½; I demand the Time it was in? *Anſ.* 4 Years, 9 Months.

11. In what Length of Time will 1080*l.* put out at 4*l.* per Cent. be increaſed to the Sum of 1382*l.* 8*s.* *Anſ.* 7 Years.

CASE 7.

Having the Principal, Intereſt, and Time given to find the Rate per Cent. that it was put out at.

RULE.

As the Principal (1ſt Number) is to the Intereſt of it for the whole Time (2d Number) ſo is 100*l.* (3d Number) to the Intereſt of a 100*l.* for the ſame Time; which Intereſt divided by the Time given, gives the Rate per Cent.

EXAMPLES.

12. At what Rate per Cent. will 643*l.* 15*s.* 6 Years to come, amount to the Sum of 798*l.* 5*s.* *Anſ.* 4*l.* per Cent.

13. At what Rate per Cent. will 1765*l.* 10*s.* 4 Years 9 Months to come, be increaſed to the Sum of 2184*l.* 16*s.* 1*d.* ½. *Anſ.* 5*l.* per Cent.

III. *Of* ASSURANCES *or* BROKERAGE.

Theſe are both performed in the ſame Manner as Intereſt; if the Rate per Cent. be given in Pounds, the Anſwer will be in Pounds or Parts of a Pound; and if the per Cent. be given in Shillings, yet will the Anſwer be in Shillings.

I. ASSURANCES.

1. What is the Premium of 2000*l.* at 6*s.* per Cent. *Anſ.* 120*s.* or 6*l.*

2. What

2. What is the Premium of 2300*l.* at 2*s.* 6*d.* per Cent. *Anſ.* 57*s.* 6*d* or 2*l.* 17*s.* 6*d.*

A Ship is inſured from London to Leghorn, at 5*l.* ½ per Cent. on the Sum of 1750*l.* I demand the Premium. *Anſ.* 96*l.* 5*s.*

3. A Merchant aſſured his Ship bound to the Eaſt-Indies, for 1650*l.* and the Cargo for 4100*l.* for which he paid 8*l.* ½ per Cent. and the Office, in Caſe of a Loſs, was to pay 98*l.* per Cent. deducting ½ per Cent: Now the Ship was caſt away, and nothing ſaved; I demand what the Aſſurance Office paid, and what Loſs they ſuſtained? *Anſ.* The Premium paid was 488*l.* 15*s.* The Loſs the Office paid him was 5606*l.* 16*s.* 6*d.* this—488*l.* 15*s.* = 5118*l.* 1*s.* 6*d.* the Money that the Office loſt by the Aſſurance.

II. *Of* BROKERAGE, COMMISSION, *or* FACTORAGE.

This is an Allowance made to *Brokers* for their Trouble in finding Perſons that are ready to buy or ſell Stocks; or to *Factors* for their *Commiſſion.*

RULE.

This is done the ſame as Intereſt, *viz.* divide by 100, and take the given Parts out of that Sum: Or if it be given in Shillings and Pence, multiply by the Shillings, and take the Parts for the Pence out of the Top; then add all the Sums together, and then cut off 2 Figures, (*viz.* divide by 100) and the Figures towards the left Hand will be the Anſwer in Shillings.

What is

1. What is the Brokerage on 1750*l.* at 4*s.* per Cent. *Anſ.* 3*l.* 10*s.*

£		s.		£. s.		Or
17	50	4	⅕	17 10		1750
	20					4
£				£3 10*s.* *Anſ.*		
10	00					70|00

Anſ. 70*s.* or 3*l.* 10*s.*

2. What

2. What is my Commiſſion of 2550*l.* at Half a Crown per Cent. *Anſ.* 3*l.* 3*s.* 9*d.*

3. What is my Commiſſion upon 1760*l.* at 3*l.* $\frac{1}{8}$ per Cent. *Anſ.* 55*l.*

SECT. XXI.

Of COMPOUND INTEREST.

Sch. *WHAT do you mean by* Compound Intereſt?

Maſt. Intereſt compounded, that is, Intereſt upon Intereſt; that is, if I borrow any Sum of Money, ſuppoſe 100*l.* at 5*l.* per Cent. then it is plain in 1 Year, the Principal and Intereſt will be 105*l.* then the 2d Year it will not be the Intereſt of 100*l.* but of 105*l.* which will be 5*l.* 5*s.* and the 3d Year, it will be the Intereſt of 110*l.* 5*s.* *&c.*

RULE.

Find the Intereſt for 1 Year, and add it to the Principal; then find the Intereſt of both Principal and Intereſt for the 2d Year, and thus proceed for the Years given.—Subtract the Principal itſelf from the laſt total Sum, it gives the *Compound* Intereſt for the Time.

EXAMPLES.

1. What is the Compound Intereſt of 1000*l.* for three Years; or what Sum will it amount to in that Time? *Anſ.* It will amount to 1157*l.* 12*s.* 6*d.* and the Compound Intereſt 157*l.* 12*s.* 6*d.*

2. What is the Compound Intereſt of 115*l.* 1*s.* for 5 Years, 7 Months, 15 Days, at 5*l.* per Cent. *Anſ.* 36*l.* 7*s.* 4*d.* $\frac{1}{2}$.

3. What is the Compound Intereſt of 370*l.* for 6 Years, at 4*l.* per Cent. per Annum? *Anſ.* 98*l.* 3*s.* 4*d.* $\frac{1}{4}$.

SECT.

SECT. XXII.

Of REBATE *or* DISCOUNT.

Sch. *WHAT is* Diſcount *or* Rebate?

Maſt. It is allowing or abating ſo much Money due at any Time to come; ſo that the preſent Money paid down, with the Intereſt of it for the Time, added together, will be equal to the whole Debt.

RULE.

Add the Intereſt at the Rate per Cent and Time given to 100*l.* and make this your 1ſt Number; and 100*l.* your 2d Number, and the given Debt your 3d Number, and the Anſwer will be the *Preſent Money*. OR

Make the Intereſt for the Time + 100*l.* your 1ſt Number; the Intereſt for the Time your 2d Number and the Debt your 3d Number, ſo will the Anſwer be the *Rebate* required.

EXAMPLES.

A had a Note upon B of 100*l.* due 12 Months to come, but being in great Want for Money, got C to diſcount the Note, at 5*l.* per Cent. I demand how much preſent Money A ought to receive, or how much Diſcount C ought to have? *Anſ.* The Diſcount is 4*l.* 15*s.* 2*d.* $\frac{3}{4}$ $\frac{45}{105}$, which taken from 100*l.* leaves the preſent Money 95*l.* 4*s.* 9*d.* $\frac{60}{105}$

Sch. I ſhould have thought that the Diſcount is exactly 5*l. and the preſent Money* 95*l.*

Maſt. Know this is a common and cuſtomary Error, but it is not right, for the Diſcounter has more Diſcount than he ought to have, and the Perſon who had the Note, has not enough preſent Money.

Sch. Pray make this appear?

Maſt. If you conſider the Intereſt of 95*l.* for one Year or 12 Months, at 5*l.* per Cent. is but 4*l.* 15*s.* which added to the preſent Money 95*l.* gives in all but 99*l.* 15*s.* inſtead of 100*l.* therefore it is 5*s.* too little; but if you proceed according to the Rule, you will have a true Anſwer. Thus,

If

If 105*l.* gives 100*l.* what will 100*l.* give. *Anſ.* 95*l.* 4*s.* 9*d.* $\frac{60}{105}$ 0 *qr.* the preſent Money; the Intereſt of which for one Year, at 5*l.* per Cent. is 4*l.* 15*s.* 2*d.* $\frac{3}{4}$ $\frac{45}{105}$, which added to 95*l.* 4*s.* 9*d.* $\frac{60}{105}$ 0 *qr.* gives juſt 100*l.*

Sch. I ſee it now very plainly.

More EXAMPLES.

2. What preſent Money will ſatisfy a Debt of 219*l.* due a Year hence, allowing Rebate at 6*l.* per Cent. *Anſ.* 206*l.* 12*s.* Rebate 12*l.* 8*s.*

3. What preſent Money will diſcharge a Debt of 714*l.* due 2 Years $\frac{1}{4}$ or 3 Months to come, allowing Rebate at 6*l.* per Cent. *Anſ.* 629*l.* 1*s.* 5*d.* $\frac{3}{4}$ $\frac{203}{227}$. Rebate 106*l.* 19*s.* 0*d.* $\frac{1840}{2270}$.

4. A dying, left B his Son, an Eſtate of 1409*l.* 12*s.* 4*d.* which he was not to have till 4 Years and 5 Months to come; but he wanting Money, offered to ſell it to C, the Tenant, for preſent Money; I demand what preſent Money will diſcharge the Debt, at 6 per Cent, and what is the Diſcount upon that Sum that was left to B. *Anſ.* The preſent Money or Caſh paid down is 1114*l.* 6*s.* 5*d.*; and the Diſcount is 295*l.* 5*s.* 11*d.* the Fractions excepted.

SECT. XXIII.

Of EXCHANGE.

Sch. *WHAT is* Exchange?

Maſt. It is like Barter in Effect; for it is only Money, Weight or Meaſure received in any Nation or Country, to be paid the ſame in Value by another Nation or Country.

Sch. I underſtand this; but I have read of, and often heard Perſons talking about the Par *and* Courſe *of Exchange; pray what are theſe?*

Maſt. The *Par* of Exchange is always the ſame; for it is only the real and true intrinſic Value of any foreign Coin.

Sch.

Sch. What is the Courſe of *Exchange*?

Maſt. This is at no Certainty, but differs almoſt every Day, according as Money or Caſh may be more or leſs plentiful or ſcarce, and therefore this *Courſe* or *Alteration* is ſaid among Merchants, to be above or below *Par*, viz. more or leſs than the real Value: Do you underſtand me?

Sch. I do very well.

Maſt. Then you are to obſerve the Exchange *London* makes with other Places.

I. FRANCE.

The *French* keep their Accompt at *Paris*, *Lyons*, *Rouen*, *&c.* in Livres, Sols and Deniers, the Exchange by the Crown being = 4*s.* 6*d.* at Par.

TABLE.

12 Deniers	}	{	1 Sol.
20 Sols	} Make	{	1 Livre.
3 Livres	}	{	1 Crown.

EXAMPLES.

1. What muſt be paid in *London* to receive at *Paris* 1516 Crowns Exchange, at 4*s.* 8*d.* per Crown? *Anſ.* 353*l.* 14*s.* 8*d.*

2. A Merchant in *London* remits to his Correſpondent at *Paris*, 353*l.* 14*s.* 8*d.* how many French Crowns at 4*s.* 8*d.* each, muſt he receive for it? *Anſ.* 1516 Crowns.

II. HOLLAND, FLANDERS, *and* GERMANY.

The Accompts are kept chiefly at *Amſterdam*, *Rotterdam*, *Antwerp*, *Bruſſels*, *Hamburgh*, *&c.*—Some in Guilders, Stivers, and Pennings; others in Pounds, Shillings and Pence.—The Exchange with us is one of our Pounds with the Pound Flemiſh, at 33*s.* 4*d.* Par.

TABLE.

8 Pennings	Make	1	Grote.
2 Grotes		1	Stiver.
6 Stivers		1	Schelling.
20 Stivers		1	Guilder or Florin.
20 Schellings		1	Pound.

RULE.

As 1 Pound Sterling to the Rate given, ſo is the *Flemiſh* given, to the *Flemiſh* ſought. Or,

As the given Rate, is to 1 Pound Sterling, ſo is the *Flemiſh* Sum given to the Sterling required.

EXAMPLE.

1. A in *London* acquaints his Correſpondent B in *Amſterdam*, that he diſburſed 500*l.* Sterling on his Ac ount; what muſt I pay in *Amſterdam*, when the Courſe of Exchange is 33*s.* 4*d.* *Flemiſh* for one Pound Sterling. *Anſ.* 833*l.* 6*s.* 8*d.*

2. A Merchant at *Hamburgh* remits 2527*l.* 11*s.* 6*d.* *Flemiſh*, to his Correſpondent in *London*, what Sterling Money ought he to draw for, when the Exchange is 33*s.* 6*d.* *Flemiſh*, per Pound Sterling. *Anſ.* 1509*l.*

III. SPAIN.

Here Accompts are kept at *Madrid*, *Cadiz*, *Seville*, *&c.* in Dollars, Rials, Marvedies or Maravedies, and the Exchange is by the Piece of Eight = 4*s.* 6*d.* Par.

TABLE.

54 Marvadies	Make	1	Rial.
8 Rials		1	Piaſtre or Piece of Eight.
10 Rials		1	Dollar.

EXAMPLES.

1. A Merchant at *London* remits to his Correſpondent at *Cadiz*, 1188*l.* 12*s.* to receive the ſame in Dollars, at 56*d.* each. How many ought he to receive? *Anſ.* 5094.

2. A Mer-

2. A Merchant at *Cadiz* remits to his Correſpondent in *London* 5094 Dollars, at 56*d.* each, to receive the ſame in Sterling Money. What muſt he receive? *Anſ.* 1188*l.* 12*s.*

IV. PORTUGAL.

Sch. How do the Portugueſe *keep their Accompts?*

Maſt. They keep their Accompts at *Liſbon* and *Oporto*, in Reas and Exchange on the Milrea, which is equal to 6*s.* 8*d.* $\frac{1}{2}$ at Par.

N. B. One Thouſand Reas make a Milrea.

EXAMPLES.

1. A Merchant at *London* draws a Bill upon his Correſpondent at *Liſbon*, for 666*l.* 13*s.* 4*d.* to receive the ſame in Milreas, at 6*s.* 8*d.* each. How many muſt he receive? *Anſ.* 2000.

2. A Perſon in *Oporto* remits to his Correſpondent at *London* 1375 Milreas at 6*s.* 5*d.* each, to receive the ſame in Sterling Money; what muſt he receive? *Anſ.* 441*l.* 2*s.* 11*d.*

V. ITALY.

Sch. In what Manner are Accompts kept here?

Maſt. At *Leghorn* and *Genoa*, in Livres, Sols and Deniers, and exchange by the Piece of Eight or Dollar, at 4*s.* 6*d.* at Par.

TABLE.

12 Deniers	Make	1 Sol.
20 Sols		1 Livre.
5 Livres		1 Genoa Piece of Eight.
6 Livres		1 Leghorn Piece of Eight.

At *Venice* and *Florence*, Exchange by Ducats and Ducatoons.

Thus, 6 Solide	Make	1 Groſs.
14 Groſſes		1 Ducat.

EXAMPLES.

1. A Gentleman on his Travels through *Leghorn*, would exchange 107*l.* 15*s.* 4*d.* for Dollars, at 53*d.* each; how many ought he to receive? *Anſ.* 488.

2. A Merchant at *Venice* ſent to *London* 825 Pieces of Eight at 53*d.* each, to receive the ſame in Sterling Money; I demand what he ought to receive? *Anſ.* 182*l.* 3*s.* 9*d.*

N. B. There is a Difference between Bank Money and current Money in theſe Places; which Difference is called *Agio*, viz. the Advance of the Bank above the current Money, and this is from 3 to 6 per Cent. in Guilders; therefore by the Rule of Three,

To turn Bank into Current Money.

1. As 100 Guilders Bank, is to 100 with the Agio added; ſo is the Price of the Bank to the current Money required.

To turn Currency into Bank.

2. As 100 with the Agio added, is to 100 Bank; ſo is the current Money given, to the Price the Bank bears.—Do you underſtand me?

Sch. I think I do, for the firſt of theſe Rules are, I ſee, done like Diſcount; by adding the Rate or Agio to the firſt Number, becauſe I muſt have leſs Bank; but it muſt be my middle Number if the Currency is required in Exchange.

Maſt. You are right; you pleaſe me well; but pray how would you proceed to perform an Operation?

Sch. Pleaſe to try me, for I think I can do it without ſhewing, if you do not ſet it me quite out of the Way.

Maſt. No, I would never endeavour too much to puzzle ſuch reaſonable Boldneſs and Emulation.—Come obſerve then.

EXAMPLE.

A Gentleman at *Hamburgh* was obliged to change 1589 Florins or Guilders, and 10 Stivers current Money, into Bank Florins; how many did he receive?

Sch.

Sch. He received 1522 *Florins,* 17 *Stivers,* 7 *Pennings, and the Way I do it is this.—First,* $4\frac{3}{8} = 4.375$, *and* 10 *Stivers being* $\frac{1}{2}$ *a Guilder* $= .5$; *therefore, as* 104.375 : 100 :: 1589.5 : 1522.874 = 1522 *Florins,* 17 *Stivers,* 7 *Pennings, Answer as before.*

Mast. You really delight me to see you perform Things so readily; and I am glad you understand Decimal Fractions so well, for certainly Interest, Discount, &c. are the more easily performed by them.

Of WEIGHTS *and* MEASURES.

I. *Of* SIMPLE COMPARISON.

RULE.

This is done by the Rule of Three, by minding the Condition of the Question, and the required Answer.

EXAMPLES.

1. Suppose 100 Ells of *Antwerp* make 75 Yards of *London* Measure; how many Yards of *London* will be equal to 54 Ells of *Antwerp? Ans.* 40 $\frac{1}{2}$ Yards.

2. If 60 lb. at *London* make 56 lb. at *Leghorn*; how many lbs. at *London* will be equal to 700 lb. at *Leghorn? Ans.* 750 lb.

II. *Of* COMPOUND COMPARISON.

This is when the Coin, Weights or Measures of various Countries are linked together, and compared with each other, till it is required how much of the first Sort will be equal to the Quantity given of the last Sort.

RULE I.

Range or place the Numbers in two Rows, *viz.* set the 1st on the left; the next by the Side of it on the right; then the 3d under the 1st in the left Hand Row; and the 4th under the right Hand Row; and thus go on, but observe that the last Number be placed on the left Row.—Then

RULE 2.

Multiply all the Numbers on the left Hand together for a Dividend, and thoſe on the right Hand for a Diviſor; and the Quotient will give the Anſwer.

EXAMPLES.

If 61b. at *London*, make 51b. at *Venice*; and 501b. at *Venice* make 601b. at *Naples*; how many lb. of *London* will be equal to 201b. at *Naples*. *Anſ.* 20.

Note. But when it is required to know how much of the laſt Sort is equal to the firſt given, then place the Numbers as before, only let the laſt fall on the right Hand inſtead of the firſt.

If 61b. at *London* make 51b. at *Venice*; and 501b. at *Venice* make 601b. at *Naples*; how many lb. at *Naples* will be equal to 201b. at *London*? *Anſ.* 20.

SECT. XXIV.

ALLIGATION MEDIAL.

Sch. WHAT is Alligation Medial?

Maſt. It ſhew us how to mix various Commodities together of different Prices; and to find the mean Price they ought to be ſold at when ſo mixed.

RULE.

As the Total of the whole Compoſition mixed, is to the total Value of the whole; ſo is any Part of the Compoſition to the mean Price required.

EXAMPLES.

1. A Maſter mixes 40 Buſhels of Malt, worth 5*s.* per Buſhel, with 72 Buſhels at 3*s.* per Buſhel, and 80 Buſhels at

at 2*s.* per Buſhel? I demand what a Buſhel of this Mixture is worth? *Anſ.* 3*s.*

For 40 × 5 = 200
72 × 3 = 216 Buſh. Shill. Buſ. Sh.
80 × 2 = 160 Then, As 192 : 576 :: 1. : 3.
——— *Anſ.*
192. 576
——— ——

2. A Mealman mixes 30 Buſhels of Flour, at 5*s.* per Buſhel, with 10 Buſhels at 6*s.* a Buſhel; and with 40 Buſhels at 4*s.* per Buſhel; what is a Sack (*viz.* 5 Buſhels) of this Mixture worth. *Anſ.* 1*l.* 3*s.* 1*d* $\frac{1}{2}$.

3. A Vintner mixes 214 Gallons of Canary, at 7*s.* 6*d.* per Gallon, with 416 Gallons at 5*s.* 4*d*; with 312 Gallons, at 9*s.* 5*d.* with 145 Gallons, at 8*s.* 7*d.* and 254 Gallons, at 9*s.* 2*d.* I demand what this Mixture is worth per Gallon? *Anſ.* 7*s.* 8*d.* $\frac{1}{4}$ $\frac{1}{1}\frac{2}{3}\frac{3}{4}\frac{1}{1}$.

4. A Grocer mixes 12lb. of Tea, at 5*s.* 6*d.* per lb. with 10lb. of 9*s.* per lb. with 8lb. at 6*s.* 6*d.* per lb. and 10lb. at 14*s.* I demand what a lb. of this Mixture is worth. *Anſ.*

II. ALLIGATION ALTERNATE.

Sch. What is underſtood by this Rule?

Maſt. This is juſt the contrary of Alligation Medial; for as there the Quantities are given to find the mean Price; here you diſcover the Quantities that are to be mixed, and the Price of ſuch Mixture; and this is performed by the following

RULE.

Having placed the different Prices one under another (in Shillings or Pence) place the Price that the Mixture is to be ſold at by the Side of them; then link or join together any two Numbers of thoſe different Prices, ſo that one of them ſo linked, may be greater, and the other leſs than the Price when mixed; this being done, ſubtract any one of the Numbers linked from the Price when mixed, and place the Difference againſt the other Number that it is linked or coupled with; do the ſame with every one of the Prices or Numbers.

EXAMPLE.

EXAMPLE.

1. A Mealman mixes 20 Buſhels of 2 Sorts of Flour together, *viz.* ſome of 5 *s.* per Buſhel, and ſome of 3 *s.* 4 *d.* per Buſhel, that the Whole, when mixt, may be worth 4 *s.* per Buſhel; how much muſt he take of each Sort.

Price.

	d.	60 *d.*	}	8
Mean Price	48	40 *d.*	}	12
				20

Anſ. He muſt take 8 Buſhels of that of 5 *s.* and 12 Buſhels of that of 3 *s.* 4 *d.* and the Mixture will be worth 48 *d.* or 4 *s.* per Buſhel.

OPERATION.

I take 48, the mean Price from 60, the beſt Price or Sort, there remains 12, which I place againſt 40, the coarſer Sort; then I take 40, the worſt Sort from the mean 48, and place 8, the Difference againſt 60 the beſt Sort; and it is done.

PROOF.

20 Buſhels, *viz.* 12 Buſhels at 40 *d.* or 3 *s.* 4 *d.* per Buſhel = 40 *s.* and 8 Buſhels, at 5 *s.* per Buſhel = 40 *s.* both = 80 *s.* = 4 *l.* Now 20 Buſhels, at 48 *d.* or 4 *s.* per Buſhel, is = 4 *l.* alſo, conſequently the Anſwer is right.

Note. Whenever you have gained a true Anſwer, by finding how much of any Sort, mixt with a more inferior, or with a better Sort, ſhall be worth ſuch a fixed Price; you may from thence find an infinite Number of Anſwers, only by finding Numbers in Proportion to each other, as the Anſwer itſelf was.—Thus the Anſwer was 8 and 12, but ſuppoſe the Quantity not limited.

Then	2	4	6	8	10	12	14	16,	*&c.* Buſhels of the beſt.
Mixed with	3	6	9	12	15	18	21	24,	*&c.* Buſhels of the worſt.

EXAMPLES

EXAMPLES *not regarding Quantity.*

2. A Vintner mixes 4 Sorts of Wine, some of 6*s.* some of 6*s.* 8*d.* some of 8*s.* and some of 9*s.* 4*d.* per Gallon; what Quantity must he take of each, to make a Mixture that will be worth 7*s.* 4*d.* per Gallon.

d.	72	24 = 3 *	Or 88	72	8 = 1
	80	8 = 1		96	16 = 2
88	96	8 = 1		80	24 = 3
	112	16 = 2		112	8 = 1

* Here in Operation the first Answer is 24 Gallons, at 6*s.* mixed with 8 Gallons, at 6*s.* 8*d.* with 8 at 8*s.* and with 16 at 9*s.* 4*d.* will be worth 7*s.* 4*d.* per Gallon. Or by abbreviating the Numbers; you have 3, 1, 1 and 2 Gallons,

PROOF.

3 Gallons, at 6*s.* per Gallon	0	18	0
1 Gallons, at 6*s.* 8*d.*	0	6	8
1 Gallon, at 8*s.*	0	8	0
2 Gallons, at 9*s.* 4*d.*	0	18	8
7 Gallons cost	2	11	4
7 Gallons, at 7*s.* 4*d.* mixed, is	2	11	4

Or by the second Operation.

There are 8 Gallons at 6*s.* mixed with 16 at 8*s.* with 24 at 6*s.* 8*d.* and 8 at 9*s.* 4*d.* which abbreviated, will be as follows.

1 Gallon, at 6*s.* per Gallon	0	6	0
2 Gallons, at 8*s.*	0	16	0
3 Gallons, at 6*s.* 8*d.*	1	0	0
1 Gallon, at 9*s.* 4*d.*	0	9	4
As before	2	11	4

3. A Grocer would mix Sugars of different Prices together, *viz.* some of 6*d.* per lb. some of 7*d.* and some of 4*d.* per lb. that when mixed, may be worth the Price of 5*d.*

per

per lb. what Quantity of each muſt he take? *Anſ.* 1 lb. at 6*d.* 1 lb. of 7*d* and 3 lb. of 4*d.*

III. ALLIGATION PARTIAL.

Sch. I am highly obliged to you, Sir, and I plainly ſee the Nature of the two former Rules; and what is it that Alligation Partial *teaches?*

Maſt. Having the different *Prices* of all the Simples, and the *Quantity* of any one of them, and the Mean Rate given, to find the other Quantities.

RULE.

1. Subtract the Mean Rate from each Price, or the Price from the Mean Rate, and place the Difference as before. Then,

2. As the Difference of the *Simple*, whoſe *Quantity* was given, to the reſt of the Differences ſeverally; ſo is the given *Quantity* to the ſeveral *Quantities* required.

EXAMPLES.

1. A Vintner would mix 8 Gallons of Wine, at 9*s.* 4*d.* per Gallon, with ſome of 6*s.* per Gallon, with ſome of 6*s.* 8*d.* per Gallon, with ſome at 8*s.* per Gallon, ſo that when mixed, may be worth 7*s.* 4*d.* per Gallon; how much muſt he take of each Sort? *Anſ.* 8 Gallons at 6*s.* 24 Gallons at 6*s.* 8*d.* 16 Gallons of 8*s.* and 8 Gallons of 9*s.* 4*d.*

2. A Brandy Merchant mixes 32 Gallons of French Brandy, worth 7*s.* per Gallon, with ſome of 12*s.* per Gallon, and with Engliſh Spirits at 4*s.* per Gallon, which when mixed, may be worth 8*s.* per Gallon; what Quantity muſt he take of each? *Anſ.* 32 Gallons at 7*s.* 32 Gallons at 4*s.* and 40 Gallons at 12*s.* which you may prove at Leiſure.

IV. ALLIGATION TOTAL.

Sch. What do you mean by Alligation Total?

Maſt. Is when the Quantity to be mixed, the Price of each Simple, and the Mean Rate are given, to find how much of each Sort will make up the Quantity required.

RULE.

1. Take the *Difference* between the *Mean Rate* and the *Prices* as before; then,

2. As the Sum Total of the *Differences*, is to each particular *Difference*; ſo is the *Quantity* given, to the *Quantities* required.

EXAMPLES.

A Vintner has 4 Sorts of Wine, ſome of 6 *s.* ſome of 6 *s.* 8 *d.* ſome of 8 *s.* and ſome of 9 *s.* 4 *d.* of which he would make a Mixture of 56 Gallons, worth 7 *s.* 4 *d.* per Gallon; how many Gallons of each Sort muſt he take? *Anſ.* 24 Gallons of 6 *s.* 8 Gallons of 6 *s.* 8 *d.* 8 Gallons of 8 *s.* and 16 Gallons of 8 *s.* 4 *d.* per Gallon. For 24 + 8 + 8 + 16 = 56. See this Example in Alligation Alternate.

V. *Of the* USE *of* ALLIGATION *in mixing of Metals according to their different Degrees of Fineneſs; or in mixing Medicines together, according to their different Degrees of Heat, Cold and Temperate.*

EXAMPLES.

1. A Goldſmith has 4 Sorts of Gold, *viz.* ſome of 15, ſome of 20, ſome of 22, and ſome of 24 Carrats fine, from which he is to make a Gold Cup to weigh 1 lb. 9 oz. that the Mixture may be 17 Carrats fine; how much muſt he take of each? *Anſ.* 15 of 15 Carrats, 2 of 20, 2 of 22, and 2 of 24 Carrats fine.

2. A Refiner has 3 Sorts of Gold, *viz.* ſome of 20, 21, and 22 Carrats fine; and he is to make a Mixture of 1 lb. 9 oz. I demand how much of each Sort he muſt take, and what Quantity of Alloy he muſt mix with them to make the

the whole Maſs 18 Carrats fine. *Anſ.* He muſt take 3 Ounces of Alloy, and 6 Ounces of each Sort of Gold.

COMPOSITION *of* MEDICINES.

Sch. Is not this Rule of Uſe to Chemiſts, Apothecaries, &c.

Maſt. It is very uſeful; for notwithſtanding every Perſon in his Profeſſion, is ſuppoſed by Cuſtom and Practice to know what he mixes, yet in ſome Caſes he would ſtill know it better, and mix the Simples nearer Truth, by underſtanding the following Rules or Directions.

Firſt, Every Body, be it a Liquid or Solid, has in it ſome Degree of Heat or Cold, Dryneſs or Moiſture, and ſome Bodies between Heat and Cold, are ſaid to be temperate.

Secondly, There are 4 Degrees of Heat, and 4 Degrees of Cold, both deviating from the Degree of being temperate, or neither Hot nor Cold in any Degree.

Thirdly, Theſe different Qualities in Bodies, will be better expreſſed and underſtood by the following

TABLE.

Indices	1	2	3	4	5	6	7	8	9	Indices
Degrees	4	3	2	1	0	1	2	3	4	Degrees
	Cold and Moiſt.		Qualities.		Temperate.	Hot and Dry.		Qualities.	Qualities.	

Fourthly, Here you ſee *Temperate* ſtands in the Center of Cold and Heat, and therefore may repreſent a Mean.

EXAMPLES.

A Perſon has 4 Sorts of Herbs, *viz.* A, B, C, D, whoſe Qualities are as follows; A is hot in the 4th Degree; B hot in the 2d Degree; C is temperate, and D is cold in the 3d Degree: Of theſe he has made ſeparate Ointments, but now wants to make or mix 1 lb. together, ſo that the Mixture

Mixture may have the Quality of the firſt Degree of Heat; I demand how much of each Sort of Ointment he muſt take.

Anſ. 1 $\frac{1}{3}$ oz. of A of the 4th Degree of Heat.
5 $\frac{1}{3}$ oz. of B in the 2d Degree of Heat.
4 oz. of C that is Temperate.
1 $\frac{1}{3}$ oz. of D in the 2d Degree of Cold.

RULE.

Take from the foregoing Table the different Indices that anſwer to, or ſtand oppoſite to its reſpective Degree of Heat and Cold, and link them together as before; and the Degree the Mixture is to be made in, put in the Margin for a Mean, as you did in the Prices of Merchandiſe, and then proceed as before,

OPERATION.

Deg.	Oz.		Simples.
9	1	A	9 × 1 = 9
6 (7)	4	B	7 × 4 = 28
5	3	C	5 × 3 = 15
2	1	D	2 × 1 = 2

9 | 54 (6

PROOF, &c.

As 9 : 1 :: 12 : 1 $\frac{1}{3}$ A
9 : 4 :: 12 : 5 $\frac{1}{3}$ B
9 : 3 :: 12 : 4 C
9 : 1 :: 12 : 1 $\frac{1}{3}$ D

Anſ. 12 Oz.

OR,

9	4	A	9 × 4 = 36
6 (7)	1	B	7 × 1 = 7
5	1	C	5 × 1 = 5
2	3	D	3 × 2 = 6

9) 54 (6

PROOF, &c.

As 9 : 4 :: 12 : 5 $\frac{1}{3}$
9 : 1 :: 12 : 1 $\frac{1}{3}$
9 : 1 :: 12 : 1 $\frac{1}{3}$
9 : 1 :: 12 : 4

Anſ. 12 Oz.

Here you ſee are two Anſwers, and you might produce many more.

2. Suppoſe a Medicine to be made of two Simples, *viz.* 1 lb. of A hot in the 4th Degree, with 6 oz. of B hot in the 3d Degree; what will be the Quality reſulting therefrom? *Anſ.* The Indice will be $8\frac{2}{3}$ and the Quality $3\frac{2}{3}$ Degrees of Heat. And thus for any other Mixture.

Sch. I heartily thank you Sir, pray what do you treat of next?

Maſt. A very eaſy Rule, *viz.*

SECT. XXV.

Of PERMUTATION.

Sch. WHAT is meant by Permutation?

Maſt. The varying or changing the Order of Things: Or it ſhews the different Variety, Changes and various Order of placing Things.

Sch. How is this performed?

Maſt. Only by a continual Multiplication of the given Number into itſelf as often as is required, and that laſt Product gives the Number of Changes or Variation.

EXAMPLE.

1. How many Changes may be rang on 5 Bells? *Anſ.* 120. For $1 \times 2 \times 3 \times 4 \times 5 = 120$.

2. How many Changes may be rang on 6, 7, and 8 Bells? *Anſ.* 720 on 6; 5040 on 7; and 40320 on 8 Bells.

3. How many different Changes may be rang upon 12 Bells; and ſuppoſe 10 Changes to be rang in a Minute, how long would it take to ring the Peal completely out, allowing 365 Days, 6 Hours, to a Year. *Anſ.* 91 Years, 3 Weeks, 5 Days, 6 Hours.

4. An *Oxford* Scholar came to *London*, and took Lodgings, for which only, he paid after the Rate of 20 *l.* a Year; but having a Mind to dine in the Family, which conſiſted

conſiſted only of 5 Perſons; he aſked the Gentleman how much he ſhould give him to lodge as uſual, and dine with him only ſo long, till every Perſon ſhould ſit in a different Chair, or in a different Poſition at Table.—The Gentleman thinking, or rather unthinkingly ſuppoſing it could not be long, agreed with him for 10 Guineas; I demand how long he ſtaid, and what his Dinners coſt him one Day with another, excluſive of his Lodging? *Anſ.* He ſtaid 1 Year and 355 Days, and it coſt him every Day 3*d.* ½ only.——See Arithmetical and Geometrical Progreſſion.

SECT. XXVI.

Of FELLOWSHIP *or* PARTNERSHIP.

Sch. WHAT is the Uſe of this Rule?

Maſt. This teaches us to adjuſt the Profits or Loſſes in Trade between Partners, in Proportion to their Stock put into Trade; as alſo the Effects of a Bankrupt divided among his Creditors, or the true Legacies left by Will, when there is a Deficiency of Aſſets.

Fellowſhip conſiſts of two Parts, with or without Time, called *Single* or *Double Fellowſhip*.

1. SINGLE FELLOWSHIP *without Time.*

Sch. How is this performed?

Maſt. By the following

RULE.

As the whole Stock is to the whole Gain or Loſs; ſo is each Man's particular Share in Stock, to his particular Gain or Loſs; which Shares added together, give the Gain or Loſs.

EXAMPLE.

Two Perſons A and B trade; A put into Stock 400 *l.* B put in 200 *l.* they gain by Trade 500 *l.* I demand the Share of each? *Anſ.* A 333 *l.* 6 *s.* 8 *d.* and B 166 *l.* 13 *s.* 4 *d.*

OPERATION.

A 400 + B 200 = 600 *l.* Stock. Then,

As 600 : 500 :: 400 : 333 *l.* 6 *s.* 8 *d.* A's Share.

As 600 : 500 :: 200 : 166 *l.* 13 *s.* 4 *d.* B's Share.

2. Three Merchants A, B, and C join in Partnerſhip; A put into Stock 750 *l.* B put in 460 *l.* and C put in 500 *l.* they gain by Trade in 1 Year 684 *l.* I demand the Share of each? *Anſ.* 300, B 184, and C 200.

3. A Bankrupt had 3 Creditors A, B and C, he owes A 140 *l.* B 300 *l.* and C 160 *l.* but his Effects amount to no more than 480 *l.* that is, there is 120 *l.* deficient. I demand what each Man muſt bear of the Loſs? *Anſ.* A loſes 28 *l.* B 60 *l.* and C 32 *l.*

4. Four Merchants A, B, C and D, build a Ship, which coſt them 1694 *l.* of which A paid 704 *l.* 12 *s.* B paid 109 *l.* 12 *s.* C 607 *l.* 17 *s.* and D 271 *l.* 19 *s.* They freight her, and in her firſt Voyage they cleared or gained between 102 *l.* what is the Share of each?

Proceed as before directed, and you will find the Anſwers with the Remainders added, to be as follows.

viz.

	£.	s.	d.	Remainders.	
A	42	8	6	0/0 — 24000	Carry 2.
	6	11	11	3/4 — 10840	
	36	12	0	0/0 — 5760	
	16	7	5	3/4 — 27160	
£	102	0	0	0/0	67760
					33860

II. FELLOW-

II. FELLOWSHIP *with Time, called* DOUBLE FELLOWSHIP.

Sch. Wherein does this differ from Fellowſhip *without Time?*

Maſt. In no reſpect but in the Limitation of the Time, and in Proportion thereto.

RULE.

N. B. Multiply every Man's particular Stock by the given Time; and then add all the Products together, and make it your firſt Number, and the Profit and Loſs your 2d Number; and every Man's Stock by the Time, your 3d Number is the Rule of Three.

EXAMPLES.

1. Two Merchants enter into Partnerſhip, A put into Stock 2000*l.* for 4 Months; and B put in 1000*l.* for 2 Months, they gain by Trade 250*l.* what's the Share of each? *Anſ.* A gained 200*l.* and B 50*l.*

2. The Merchants A, B, and C trade as follows; A put into Stock 500*l.* for 12 Months; B put in 800*l.* for 5 Months; and C put in 200*l.* for 10 Months: They loſe by Trade 1000*l.* I demand what each Man muſt bear of the Loſs? *Anſ.* A muſt bear 500*l.* B 333*l.* 6*s.* 8*d.* and C 166*l.* 13*s.* 4*d.*

3. Three Perſons A, B and C, enter into Partnerſhip for 12 Months; A put into Stock 100*l.* for 8 Months, and then put in 200*l.* more for the reſt of the Time; B put in 150*l.* for 6 Months, and after that put in 200 more; C put in 500*l.* for 4 Months, and then took out of the Stock 250*l.* at the Year's End they ſettle Affairs, and find they had gained by Trade 1000*l.* what is the Share of each?

	£.	*s.*	*d.*		
A's Share is	222	4	5 $\frac{1}{4}$	$\frac{8000}{90000}$ =	$\frac{8}{90}$
B's	333	6	8		
C's	444	8	10 $\frac{1}{2}$	$\frac{60000}{90000}$ =	$\frac{6}{9}$
Proof	1000	0	0 $\frac{0}{6}$		$\frac{0}{0}$

SECT. XXVII.

The RULES *of* FALSE, *called* FALSE POSITION.

Sch. WHAT *do you mean by the Rule of* False?

Maſt. It is that Rule by which you ſuppoſe or gueſs at any certain Number or Numbers, which, though *falſe*, yet in working the Queſtion, will come out true.

RULE.

As the Sum of all the falſe Numbers, is to the Aſſertion or Total given; ſo is any falſe Number to the Number required.

EXAMPLE.

Three School Boys, A, B and C, diſcourſed about their Ages, ſays B to A, I am $\frac{1}{3}$ of your Age older than you; and ſays C to B, I am $\frac{1}{4}$ of your Age older than you; and ſays A, I know all our Ages together make 36; I demand the Age of each? *Anſ.* A 9, B 12, and C 15.

OPERATION.

Take any 2 Numbers of which you can take $\frac{1}{3}$ and $\frac{1}{4}$, ſuppoſe for Inſtance, A was 6 Years old, then B $\frac{1}{3}$ more, will be 8, and C $\frac{1}{4}$ more than this, will be 10. Add theſe together, *viz.* $6 + 8 + 10 = 24$, but ſhould be 36, therefore ſay,

1.	As 24	: 36 ::	6 ſuppoſed	:	9 A's true Age
2.	24	: 36 ::	8	:	12 B's Age
3.	24	: 36 ::	10	:	15 C's Age
					36 Proof.

2. A Perſon

2. A Perſon overtook a Drover with a Flock of Sheep, and ſaid, well overtaken Drover with your 100 Sheep; you are miſtaken in the Number, Sir, ſays the Drover; but if I had as many more, and $\frac{1}{2}$ as many more, and $2\frac{1}{2}$ beſides, I then ſhould have 100; how many Sheep were there? *Anſ.* 39.

3. A School-Boy having a Number of Marbles in his Hat, deſired another Boy to gueſs at them, who ſaid there were 6 Score and 5; no ſays the other, if there were $\frac{1}{3}$d $\frac{1}{4}$th and $\frac{1}{6}$th more, I ſhould then have that Number; I demand how many there were? *Anſ.* 60.

II. DOUBLE POSITION.

Sch. How is this performed?

Maſt. By making Uſe of 2 falſe Numbers, and by working with the Errors that ariſe, you will thereby diſcover the true Anſwer, as appears by the following

RULE.

Firſt, Suppoſe any Number or Numbers at Pleaſure, that will anſwer the Condition of the Queſtion propoſed, and work with it or them, the ſame as if it were the real true Number; and if it comes out too *much* or too *little*, viz. *more* or *leſs* than the given Number, note it down, and call this the 1ſt *Error*; then propoſe another Number, and do the ſame.

Secondly, Set the 1ſt *Error* right againſt the 1ſt *Poſition* or Number you worked by, and the 2d *Error* againſt the 2d *Poſition*, and multiply them croſs-ways, *viz.* the 1ſt *Poſition* by the 2d *Error*, and the 2d *Poſition* by the 1ſt *Error*. Then,

Thirdly, If the *Errors* be both too *much* or both too *little*, make the Difference of the Products (before mentioned) your *Dividend* and the Difference of the *Errors* your *Diviſor*; but if *one* be too *much*, and the *other* too *little*, make the Sum of the ſaid Products a *Dividend*, and the Sum of the *Errors* for a *Diviſor*, and the *Quotient* gives the true Anſwer.

EXAMPLES.

EXAMPLES.

1. What Number is that which being multiplied by 12, and having 18 added to the Product, the Sum will be 294? *Anſ.* 23.

2. What Number is that, to which if I add 24, then from that Sum ſubtract 8, and multiply the Remainder by 5, the Product will be 320? *Anſ.* 48.

3. Three School Boys, *Tommy*, *Billy*, and *Charly*, had 200 Marbles divided between them; *Billy* had 6 more than *Tommy*, and *Charly* had 8 more than *Billy*; how many had each? *Anſ. Tommy* 60, *Billy* 66, and *Charly* 74.

4. *Alexander* ſaid to *Epheſtion*, I am older than you by 2 Years; *Clitus* being preſent, ſaid, I am older by 4 Years than both of you; and my Father who is now 96, is as old as all of us; I demand the ſeparate Ages of *Alexander*, *Epheſtion* and *Clitus*. *Anſ. Alexander* 24, *Epheſtion* 22, and *Clitus* 50.

5. Three Perſons A, B and C, trade and gain 3000 *l.* The Share of A was $\frac{1}{2}$ the Share of B, and the Share of B $\frac{1}{3}$ the Share of C; I demand the Share of each? *Anſ.* A 333 *l.* 6 *s.* 8 *d.* B 666 *l.* 13 *s.* 4 *d.* and C 2000 *l.*

6. A Perſon had a Number of Guineas in a Bag, deſired a Stander-by to gueſs at them, who anſwers 600: No, ſays he, if to what I have were added $\frac{1}{2}$, $\frac{1}{3}$ and $\frac{1}{4}$, and from that Sum were ſubtracted $\frac{1}{12}$ of what I now have, the Remainder would then be 600; I demand what Number he had? *Anſ.* 300 *l.*

SECT. XXVIII.

Of PROGRESSION.

Sch. *WHAT do you mean by* Progreſſion?

Maſt. The regular *Progreſſion*, *Moving*, or *Flowing* of a Number in a *Progreſſive*, *regular* and *uniform* Order, according to a certain given Rate or Ratio.

Sch.

Sch. Does Progreſſion *conſiſt of more Parts than one?*

Maſt Yes, it conſiſts of 2 Parts called *Arithmetical* and *Geometrical.*

Sch. What is the Difference between them?

Maſt. Arithmetical *Progreſſion* is the Effect of a continual *Addition* or *Subtraction*, and *Geometrical Progreſſion* is the Effect of a continual *Multiplication* or *Diviſion.*

I. *Of* ARITHMETICAL PROGRESSION.

Sch. Pleaſe to define the Nature of this Rule a little more?

Maſt. I will.—*Arithmetical Progreſſion* is the *Moving*, *Flowing* or *Progreſs* of Numbers in a regular and progreſſive Manner, as 1. 2. 3. 4, *&c.* proceed, or move progreſſively by 1, every following Number exceeding the foregoing by the Difference of 1, or is 1 more, and this Difference is called the Ratio. So alſo 1. 5. 9. 13. 17, *&c*, differ by 4 in *Arithmetical Progreſſion*, which 4 is called the Ratio: Again, 8. 17. 26. 35. 44. 53, *&c.* differ by the Ratio of 9. From hence ariſes the following Obſervations, which pray mind.

OBSERVATION 1.

In any Series of Numbers in *Arithmetical Progreſſion*, if the Series be odd as 1. 5. 9. 13. 17. the double of the *Mean* will be equal to the 2 *Extremes*, that is, the *firſt* and *laſt* Number.—Thus in the above Numbers, 9 the *Mean*, doubled, = 18, and the *Extremes* 1 + 17 = 18, *&c.* But if the Number of Places be even, then the 2 middle Numbers equi-diſtant from the *Extremes*, will be equal to the *Extremes*; thus in the foregoing Numbers, 8. 17. 26. 35. 44 and 53; the 2 middle Terms or Numbers 26 and 35, will be equal to the *Extremes* 8 and 53; for 8 + 53 = 26 + 35 = 61.

OBSERVATION 2.

There are 5 Things to be obſerved in this Rule, *viz.* 1, The *firſt* Term or Numbers. Secondly, The *laſt* Term. Thirdly, The *Number* of Terms. Fourthly, The *Ratio* or *Difference* of or between the Terms; and, Fifthly, The *Sum* of all the *Terms* or the whole Series.

CASE

CASE 1.

The 1ſt, 2d and 3d Term given, that is, the firſt and laſt Number, and Number of Terms or Places given, to find the Sum or Number of all the Series.

RULE.

Multiply $\frac{1}{2}$ the Sum of the *Extremes* by the Number of Places, the Product is the Total of all: Or multiply the Sum of the 2 Extremes by $\frac{1}{2}$ the Number of Places, you have the Total.

EXAMPLES.

1. How many Times does the Clock ſtrike in twelve Hours? *Anſ.* 78.

1 + 12 = 13 Extr. then 13 × 6 ($\frac{1}{2}$ the Number of Places) = 78 Strokes.

2. Suppoſe 100 Stones to be placed a Yard aſunder from each other in a right Line; and a Man engages to pick them up one by one, bringing every ſeparate Stone back to a Baſket where the firſt Stone lay; how far does he go? *Anſ.* 5 $\frac{1}{2}$ Miles and 420 Yards, that is, 5 $\frac{1}{4}$ Miles wanting 20 Yards.

CASE 2.

The 1ſt, 2d, and 3d Term given, to find the Ratio.

RULE.

From the laſt take the 1ſt Number, and it ſhall be a *Dividend*; then take the Number of Terms, leſs 1, and make it a Diviſor, and the Quotient ſhall give the Ratio or common Exceſs.

EXAMPLES.

1. A Perſon had 9 Children, the youngeſt was 2, and the eldeſt 26, and all differed alike in Progreſs; I demand the Ratio or Difference of their Ages? *Anſ.* 3. For 26—2, the

the Fxremes = 24 and 9, the Places leſs 1 = 8 Diviſor, and 24 ÷ 8 = 3 the Ratio.

2. A Man undertook a Journey from London for a Fortnight; he was to go 2 Miles only the firſt Day, and every Day after at a certain or equal Exceſs, now the laſt Day he travelled 67 Miles, I demand the Ratio, Exceſs or daily Increaſe? *Anſ.* 5.

CASE 3.

The *Extremes*, viz. the *firſt* and *laſt* Number and *Ratio* given to find the Number of Terms.

RULE.

From the laſt Number or Extreme take the 1ſt Number, the Remainder divided by the Ratio, and 1 added to that Quotient, gives the Number of Places.

EXAMPLE.

A Perſon undertook a Journey, he went 2 Miles the 1ſt Day, and encreaſed 5 Miles every Day till the laſt Day he travelled was 67 Miles; how many Days did he travel? *Anſ.* 14 Days or a Fortnight. See the laſt Caſe.

CASE 4.

The laſt Term, Number of Places, and Ratio given, to find the 1ſt Number.

RULE.

Multiply the Number of Terms, leſs 1, by the Ratio; then ſubtract this Product from the laſt term, gives the 1ſt Number.

EXAMPLE.

A Perſon travelled daily for a Fortnight from *London* towards the North, encreaſing every Day's Journey 5 Miles, ſo that the laſt Day he went 67 Miles; I demand what he went the firſt Day? *Anſ.* 2 Miles.

CASE

CASE 5.

The laſt Term, Number of Terms, and Sum of the Terms, and Ratio given, to find the firſt Term.

RULE.

Divide the Sum of the Terms, by the Number of Places, and reſerve the Quotient; then multiply the Number of Places, leſs 1, by the Ratio, and take $\frac{1}{2}$ this Product from the aforeſaid Quotient, or the Quotient from $\frac{1}{2}$ this Product, and you have the firſt Number.

EXAMPLE.

A was indebted to B, the Sum of 720*l.* for which B threatened to arreſt him; but A promiſed to pay a certain Sum down, and diſcharge the whole by 11 other regular Payments, every one to be 8*l.* more than the 1ſt; I demand the Money A paid down, *viz.* the 1ſt Payment of A's is 16*l.*

CASE 6.

The 1ſt *Term*, *Number* of *Terms*, and *Ratio* given, to find the laſt Number.

RULE.

Multiply the Number of Places leſs 1, by the Ratio, and to that Product add the firſt Number or Term, and this Sum gives the laſt Term.

EXAMPLE.

A owed B 720*l.* and paid him 16*l.* down, and was to make 11 other Payments, whoſe *Ratio* increaſed by 8*l.* every Payment; I demand the laſt Payment, and how much it exceeded the firſt? *Anſ.* 104*l.* laſt Payment.

Maſt. It is very diverting, and there are many pretty Things to be done by it; but this is full as uſeful and as diverting, and I believe will pleaſe you as well.

Sch. What does this Rule teach, or what is the Difference between this and Arithmetical Progreſſion?

Maſt. There is a wide Difference between theſe two Rules; for the firſt was only a continual Progreſs of Numbers, differing by the Addition of any Number, but *Geometrical* Progreſſion is the continued progreſſive Increaſe of Numbers by Multiplication. Thus, 2. 4. 8. 16. 32. *&c.* increaſe by the Multiplication of 2, every next Number being the Double of its foregoing Number. So alſo 8. 64. 512. and 4096. are every of them 8 Times more than its preceding Number, and this Difference 8 Times, or any other Difference is called the *Ratio*. Do you underſtand it?

Sch. Yes, very well.

Maſt. Then you muſt carefully mind the following Obſervations.

OBSERVATION 1.

In any odd Number of Terms in Geometrical Progreſſion, the middle Number, (called always the Mean) multiplied by itſelf, will be equal to the Product of the firſt and laſt Number or Extremes.

Let the Numbers be 4. 12. 36. differing by three Times, or in a three-fold *Ratio*; then I multiply the Mean or middle Number 12 into itſelf, is equal to the Extreme $4 \times 36 = 144 = 12 \times 12$.

OBSERVATION 2.

If the Number of Terms be even, then the Product of the 2 middle Terms, or any 2 Terms equi-diſtant from the Extremes, will be equal to the Product of the *Extremes*. Let the Numbers be 4, 12, 36, 108, whoſe *Ratio* 3; I ſay 12×36 the Means, is $= 4 \times 108$, the Extremes $= 432$. Again, Let there be 3, 9, 27, 81, 243, 729, whoſe *Ratio* is 3; I ſay 27×81 Means $= 3 \times 729$ Extremes $= 2187$, and ſo if the Numbers were ever ſo many, and even withal.

OBSERVATION 3.

If in 4 Numbers they be diſcontinued between the 2d and the 3d, that is, though you ſet down the 3d Number by Gueſs or at Random, yet if you make the 4th differing from it, with the ſame Ratio as the 2d does from the 1ſt, you will ſtill find the Rectangle, or Product of the *Means*, to be equal to the Rectangle of the *Extremes*.

Let the Numbers be 4, 36, 21, 189, whoſe *Ratio* is 9; I ſay $36 \times 21 = 189 \times 4 = 756$, notwithſtanding you ſee the 3d Term is leſs than the 2d.—Or let them be 2, 12, 144 and 864; then $12 \times 144 = 864 \times 2 = 1728$.

OBSERVATION 4.

The 3 laſt Obſervations being well conſidered, you will eaſily from them and the following Caſes, ſoon learn to diſcover any one of the following Things relating to this Rule, *viz.* 1. *The 1ſt Number or Term.* 2. *The laſt Number.* 3. *The Number of Terms or Places.* 4. *The* Ratio *or* Difference *of one Term from another*; *and* 5. *The Sum Total of all the Terms or Series belonging.*

OBSERVATION 5.

The *Ratio* of any Series is found by dividing any one of the Conſequents by its Antecedent or foregoing Number.

OBSERVATION 6.

In Order to ſhorten the tedious Work of a continued *Multiplication* of a large Series of Places, the beſt Way is to ſet over the *Geometrical*, a Series of Numbers in *Arithmetical Progreſſion*, which are called *Indices*, *Indexes* or *Exponents*,

Thus 1 2 3 4 5 *Indices* in *Arith. Progreſſion.*
And 2 4 8 16 32 Numbers in *Geom. Progreſſion.*

But when the Terms in *Geometrical Progreſſion* begin with *One* or Unity, then the *Indices* or *Exponents* begin with a Cypher;

a Cypher; therefore the whole Numbers will have one Place leſs in the *Indices* than in the *Progreſſion*, thus,

0	1	2	3	4	5	6	7	8	9 and
1	2	4	8	16	32	64	128	256	512.

OBSERVATION 7.

From hence appears that the Places, or any ſingle Place remote from the 1ſt Place may be found by the *Indices* thus, add any 2 *Indices* together and the Product of the *Geometrical Progreſſion*; thus, ſuppoſe I take 2 and 3 in the *Indices*; then $2 + 3 = 5$ or the 5th Place and 4×8 (which anſwers to 2 and 3) in the *Progreſſion* $= 32$, which ſtands under the 5th *Index*: Again $2 + 7 = 9$, therefore $128 \times 4 = 512$ the 9th Place, or $4 + 5 = 9$, *viz.* $16 \times 32 = 512$ as before, thus may any remote Number be found.

CASE I.

The 1ſt Number *Ratio* and Numbers of Places given to find the laſt Number without the Help of the *Indices*.

RULE.

To find a few Number of Places at Pleaſure, by *doubling* or *trebling* the Numbers according to the *Ratio* and *Exceſs* given; this being done, ſquare the Number you left off at (*viz.* multiply it by itſelf) and the Product ſhall be double the Number of the Places leſs 1 Place.

EXAMPLE.

1. I demand the laſt Number of 11 Places in *Geometrical Progreſſion*, whoſe 1ſt Number is Unity and the *Ratio* 9.

Firſt, I multiply 1 by 9, and ſo continue to the 6th Place $1 \times 9 \times 9 \times 9 \times 9 \times 9 = 59049$ the 6th Place; and $59049 \times 59049 = 3486784401$ the 11th Place.

2. A Lady of Quality had a Cook well recommended to her, but they could not agree upon Wages; at laſt the Cook told her Ladyſhip that ſhe was very deſirous of living with her and would ſerve her for 1 Year (or 12 Months)

at the Rate of 1 Shilling per Month and double it every Month; or otherwiſe for 2 Years at the Rate of 1 Farthing per Month, 2 Farthings the 2d Month and to be paid only for her laſt Month's Service. The Lady thinking this reaſonable enough, agreed to this laſt Propoſal; what did the Maid's laſt Month's Wages come to?

Anſ. 8738*l.* 2*s.* 8*d.*

CASE 2.

The firſt and laſt Number, *Ratio* and Number of Terms given, to find the Sum or Total of all the Series.

RULE.

Multiply the laſt Term by the *Ratio*, and from that Product take the 1ſt Number and divide the Remainder by the *Ratio* leſs 1, and the Quotient gives the Sum of all the Series.

EXAMPLE.

1. A Graſier offered to ſell 15 fine fat Oxen to a Butcher for 200*l.* but the Butcher would not give it, and ſaid there was one of them that was not worth 6*d.* upon this the Graſier replied, you ſhall have them all if you will give me only 6 Pence for 1ſt, a Shilling for the 2d, 2 Shillings for the 3d, *&c.* The Butcher agreed to it. I demand how much the 15 Oxen ſold for, and what the Butcher gave more for them than what the Grazier aſk'd him at firſt? *Anſ.* They come to 819*l.* 3*s.* 6*d* which is 619*l.* 3*s.* 6*d.* more than the Butcher was aſk'd for them.

2. How much will a Horſe coſt ſuppoſing he were ſold for only the Price of his 4 Shoes, each having 8 Nails, at a Farthing per Nail, and double the Price of every Nail? *Anſ.*

3. Suppoſe 1 Grain of Wheat to be ſown and the Produce from it be ſown the 2d Year, and all that Produce ſown the 3d Year and ſo on for 20 Years, encreaſing no more than 10 Fold (which is 3 Times leſs than it is known to do) I demand how many Grains there will be in all? *Anſ.* 11111111111111111111 Grains.——Now allowing 7000 Grains to 1 Pint of Wheat, 64 Pints to a Buſhel,

Buſhel, and 40 Buſhels to a Load: I demand the Quantity without regarding the Remainders?

Anſ. 1587301587301587 Pints
248015873015 87 Buſhels
6200396825 39 Loads or Tons.

Now ſuppoſing Wheat at 4*s.* per Buſhel, it would come to the immenſe Sum of 4960317460317*l.* 8*s.* and laſtly, ſuppoſing it be carried away in Ships of 1000 Tons Burthen each, it would take 620039682 ſuch Ships to carry away and 539 Tons to ſpare, which is Half another Burden; ſo amazing is the Increaſe of continued Multiplications!

Sch. This will appear incredible indeed to ſuch Perſons who neither underſtand Figures, nor will ſuffer themſelves to conſider; but to me it appears plain, and I heartily thank you for your kind Inſtructions hitherto.

Maſt. It is very pretty to know theſe Rules, and in many Reſpects they are uſeful; but if you attend well to the two next Rules they will ſtill be more ſerviceable.

Sch. What Rules are thoſe, pray?

Maſt. The *Square* and *Cube Root*.

SECT. XXIX.

The SQUARE ROOT.

Sch. *WHAT is the* Square Root?

Maſt. It is that Rule by which we find a Number which being multiplied into itſelf will produce the original Number.

N. B. The Number given to be extracted is called the Square and the Number after ſuch Extraction is called the *Root* or *Side* of ſuch a Square as appears by the following

TABLE.

Roots	1	2	3	4	5	6	7	8	9	&c.
Squares	1	4	9	16	25	36	49	64	81	

A farther Demonſtration of a Square *and its* Root,

Here you ſee the Figure wherein I draw a Line AB and divide it into 3 Parts; I alſo draw another Line of equal Length, BC or AC which I alſo divide into three Parts, and then draw the pricked or dotted Lines from Side to Side and they form 9 Squares; that is, $3 \times 3 = 9$. Now this whole Figure is called the Square itſelf, and the Sides, which are 3, of ſuch Parts are either of them called the *Root* or *Side* of the Square.

Sch. This is very plain indeed, for I perceive if the Sides had been divided into 4 *Parts, the Square would have had* 16 *ſmall Squares in it; and had I divided the Sides* AB *and* AC *into* 9 *equal Parts, then there would have been* 81 *Squares, becauſe* $9 \times 9 = 81$, *if it were divided into* 12 *equal Part, then there would have been* 144 *Squares, productive of the Roots* 9 *or* 12, &c. &c. *for any Number.*

Maſt. You are right; but yet you do not know how to prove this by Figures.

Sch. I own it, Sir, but I hope if you give me a plain Direction I ſhall ſoon underſtand it.

Maſt. I will work three different Examples, and ſhew you the laſt or moſt difficult of them and the two firſt will then appear quite plain.

EXAMPLES.

Extract the Square Root of 144. 625 and 5525.

	144	(12 Root
	1	
	—	Proof
22	44	12
	44	12
	—	—
	0	144
	—	—

	625	(25 Root
	4	Proof
	—	25
45	225	25
	225	—
	—	125
	0	50
	—	—
		625
		—

PROCESS

	˙5˙52˙25(235	Root
	4	Proof
	——	235
43	152	235
	129	——
	——	1175
	2325	705
465	2325	470
	——	——
	0	55225

PROCESS of Ex. 3.

1st. I begin at the Unit's Place and dot off every other Figure in the Resolvend or given Number; that is, make a Dot over every other Figure.

2. I then find the nearest Root to the first Dot or Period which here is 5, and find by the Table it will be 2 for a Root.

3. This 2 I place in the Quotient like *Division*, and then square it, which makes 4, and place it under the 5 and subtract it therefrom and bring down 1 the Remainder as in *Division*.

4. I then take down the Figures in the next Period or Point, *viz.* 52, and place them by the Side of the Remainder 1 before mentioned, and it will be 152 for a Dividend.

5. Double the Root 2 (which makes 4) and place it by the Side of the Dividend 152 for a Divisor.

6. Ask how many Times the Divisor 4 is contained in the 2 first Figures of the Dividend 152, *viz.* 15, and it will be 3, which also place in the Root on the right Hand of the 2, and likewise on the right Hand of 4 the Divisor which will be 43.

7. Multiply this Divisor 43 by the Root 3 and it makes 129, which take from 152 there remains 23, to which bring down the last 2 Figures in the 3d Point or Period, *viz.* 25, and place them on the right Hand of 23 it will be 2325.

8. Now you do as in the 5th Direction, *viz.* double the Root, but where as you only doubled 2 at the 1st now you

you double the whole Root or Quotient Figures 23, which is 46, and then aſk (as in Direction 6th) how many Times 46 you can have in 232 (rejecting the laſt Figure 5) and it will be 5 Times, which 5 place alſo in the Quotient for another Root Figure, and alſo to the right Hand of the new Diviſor 46, which will be 465.

9. Multiply 465, this laſt Diviſor, by 5, the laſt Figure of the Root, and it gives 2325 which taken from 2325 leaves (0) for a Remainder: So is the Work compleated.

Laſtly. Thus you may with Eaſe extract the Square Root of any Number of Periods or Dots only by taking down Period after Period after doubling the Root and proceeding as before.

Note 1.

There will be always as many Figures in the Root as you have Dots over the Square Number given. Thus in Example 1 and 2 you have 2 Dots only, therefore the Root contains but 2 Figures, *viz.* 12 and 25; in the 3d Example you have 3 Dots in all, therefore you have 3 Figures in the Root, *viz.* 235.

Maſt. Do you underſtand this?

Sch. Very plainly, Sir, but let me aſk one Queſtion, ſuppoſe there be a Remainder after I have extracted through all the Points, how then?

Maſt. Never mind that, for in proving the Work you only ſquare the Root, *viz.* multiply it by itſelf and take in the Remainder (if any) as you do in *Diviſion*.

EXAMPLES.

4. What is the Square Root of 119025? *Anſ.* 345.
5. What is the Square Root of 106929? *Anſ.* 327.
6. What is the Square Root of 106954?
Anſ. 327 and 25 remains.
7. What is the Square Root of 119164?
Anſ. 345 and 139 rem.
8. What is the Square Root of 36372961? *Anſ.* 6031
9. What is the Square Root of 22071204? *Anſ.* 4698

Note 2.

When there is a Remainder and you want to come nearer Truth, then add Cyphers to the Reſolvend or given Number, and extract as before, but remember you will always add an even Number of Cyphers

phers, and you will have as many Decimal Places as you have Dots or Periods over them.

EXAMPLES.

10. What is the Square Root of 43623 ?

I add Cyphers and it is $43\dot{6}2\dot{3}.0\dot{0}0\dot{0}0\dot{0}0$; the Root of which is 208.861. *Anſ.*

11. What is the Square Root of 10 ? *Anſ.* 3.1622.

N. B. No Regard is paid to the Remainder after Decimals.

Note 3.

When a Vulgar Fraction is given to extract the Square Root, ſubtract the Root of the Numerator and Denominator, and if nothing remains the Roots will be a new Numerator and new Denominator for an Anſwer.

12. What is the Square Root of $\frac{625}{225}$? *Anſ.* $\frac{25}{15}$

Note 4.

When the Vulgar Fraction cannot be extracted without a Remainder, then reduce the Vulgar Fraction to a Decimal and extract the Root as if it were a whole Number.

13. What is the Square Root of $\frac{7}{8}$ths ?

Anſ. $\frac{7}{8} = .\dot{8}7\dot{5}0\dot{0}0\dot{0}0$ whoſe Root is .2958.

One Example for Practice.

14. I demand the Square Root of 975461057789971041.
Anſ. 987654321.

Sch. I'll have a Trial at it very ſoon.

Maſt. If you can work this perfectly, you will not be at a Loſs for any Thing in this Rule ; therefore we will proceed to ſhew you.

The Uſe of the Square Root.

Sch. What is the Uſe of this Rule ?

Maſt. It is to find the Sides of all Manner of Squares, to find the Sides of right angled Triangles, Mean Proportionals, to determine Heights and Diſtances, and many other

other uſeful and neceſſary Things in the Buſineſs of Life and Trade.

1. *To find a Mean Proportional between two Numbers.*

Multiply the Numbers together and extract the Square Root of them for a t ue Mean

1. What is the true Mean between 12 and 3 ? *Anſ.* 6.
2. What is the Mean between 40 and 20 ? *Anſ.* 28.28.
3. What is the true Mean Proportional between 325 and 177 ? *Anſ.* 263.67.

2. *Having the Area (or Content) of a Circle, Square, Triangle, or any other Figure given, to find the Side of a Square that ſhall be equal thereto.*

This is done only by extracting the Square Root of the Area given, and the Root ſhall be the Side of a Square, which ſquared ſhall be equal to the Area of the given Figure.

4. There is a Circle, Oval or Triangle, whoſe Area or ſuperficial Content is 60025 I demand the Side of that Square which ſhall be equal thereto ? *Anſ.* 245.

5. A certain Number of Perſons were in Company and ſpent between them 30 Shillings and a Penny and every Man paid equal alike, and as many Pence a piece as there were Men in Company ? I demand the Number of Men and how much each paid ? *Anſ.* 19 Men, 19 Pence each.

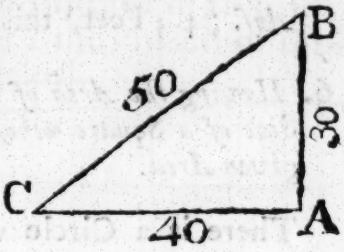
6. A Company of Grenadiers behaved ſo extremely well in a Battle that their General gave them 12 Guineas and 1 Penny to be equally divided, every Man was to have as many Pence as there were Men in Company. I demand the Number of Men and how much each had ? *Anſ.* 55 Men, 55 Pence a-piece.

3. *Having*

3. *Having the 2 Sides of any right angled Triangle given to find the other Side.*

Definition.

A Triangle conſiſts of 3 Sides, *viz.* the *Cathetus* or Perpendicular AB, the *Baſe* AC and the *Hypothenuſe* or ſlanting Side BC called by ſome the Diagonal.



CASE I.

Having the Perpendicular AB and Baſe AC given to find the *Hypothenuſe*.

Add the Squares of the Perpendicular and Baſe together and extract the Square Root of their Sum, gives the *Hypothenuſe*.

In the above Triangle AB = 30, whoſe Square is 900 and AB = 40, whoſe Square is 1600; now 1600 + 900 = 2500, whoſe Square Root (✓) is = 50 the *Hypothenuſe* BC required.

CASE 2.

Having the *Hypothenuſe* BC and Perpendicular AB, to find the Baſe AC, or having BC and CA given, to find the Perpendicular AB.

RULE.

From the Square of the Baſe of the *Hypothenuſe* take the Square of the Baſe and extract the Square Root of the Remainder gives the Perpendicular. Thus, 50 × 50 = 2500 the Square of BC, 40 × 40 = 1600 the Square of AC, now 2500—1600 = 900 whoſe ✓ Square Root is = 30 = AB the Perpendicular required: Or from the Square of the *Hypothenuſe* ſubtract the Square of the Perpendicular and the Square Root of the Remainder gives the Baſe 40 required,

ed, thus, the Square of BC = 2500 — the Square of AB 900 = 1600 the Square Root of which is 40 = AC required.

5. There is a Tower 60 Feet high, but there is a Moat round it 44 Feet wide. I demand the Length of a Scaling Ladder which will reach from the Edge or Verge of the Moat to the Top of the ſaid Tower.

Anſ. 74.4 Feet, this is done by Caſe the 1ſt.

6. *Having the Area of a Circle or any other Figure to find the Side of a Square whoſe Content or Area ſhall be equal to the given Area.*

There is a Circle whoſe Area is 3960: I demand the Side of a Square equal thereto. *Anſ.* 62.9.

6. A General of an Army of 65536 Men wants to draw them up in a Square Order for Battle. I demand how many muſt ſtand Rank and File. *Anſ.* 256.

7. A General of an Army having 16200, would place them in an oblong Square (*viz.* in a long Square Form) ſo that the Number of Men in every Rank may be double to the Number of Men in File; how many muſt there be in Rank and File? *Anſ.* 180 in Rank (that is in the Front ſtanding Side by Side) and 90 in File, that is the Depth or ſtanding behind each other.**

** Here the Rank is required to be double the File; therefore take the $\frac{1}{2}$ of 16200 and extract the Square Root of it, which will be 90 for the File and this doubled gives 180 for thoſe in the Rank.—— *N. B.* If it were required to be 3 or 4 Times as many in Rank as in File, then divide the given Number by 3, 4, *&c.* and extract the Root as before for the File, which multiplied by 3, 4. *&c.* gives thoſe in the Rank.

8. I demand how many Square Yards of Ground 180 Men in Rank and 90 Men in File will take up, ſuppoſing them to ſtand diſtant from each other 3 Feet?

Anſ. 53217 Square Feet = 5913 Square Yards.

N. B. Theſe and ſuch Sort of Queſtions do not require an Extraction of the Square Root, but they are very uſeful in many Reſpects, ſuch as the ſetting out of Plants and Trees at any Diſtance to know how much Ground they will take, and the Rule for performing of it is this.

RULE.

RULE.

As Unity or 1 is to the Diſtance between any 2 Bodies (which here is 3) ſo is the Length planted or placed leſs 1 to a 4th Number, and as 1 to the Diſtance of each ſo is the Breadth leſs 1 to a 4th Number; the Product of theſe 2 gives the Quantity of Ground required.

SECT. XXX.

The CUBE ROOT.

Sch. *What is a* Cube?

Maſt. It is a Solid, made or generated from a Line and a Square; that is, let there be a Line 3 Inches or 3 Feet long, as

AB or BC, whoſe Square, or Superficies, will be 9, (as by the 1ſt Figure in the Square Root,) then this Square 9 multiplied into the Depth AE, DF, or CG = 3, will give 27 the ſolid Content of the Cube itſelf, whoſe Sides every Way are = 3; for 3 × 3 = 9, and 9 × 3 = 27, the Cube itſelf, whoſe Root is 3, as appears by the following

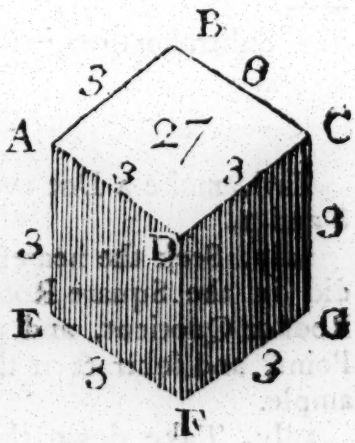


TABLE.

Roots	1	2	3	4	5	6	7	8	9
Squares	1	4	9	16	25	36	49	64	81
Cubes	1	16	27	64	125	216	343	512	729

Sch. *I underſtand this Table perfectly.*

Maſt. Then we will proceed to ſhew you how to extract the Cube Root of any Number, which, though much more difficult than the Square Root, yet is eaſily conquered by Obſervation and Practice.

EXAMPLES.

I demand the Cube Root of 1728? *Anſ.* 12.

		Proof
1728	12 Root, *Anſ.*	Root 12
1		12
728	Reſolvend	144
		12
3	Triple Quotient	
3	Triple Square	Cube 1728
33	Diviſor	
8	The Cube of the Root 2	
12	The Square of 2 by trip. Quotient	
6	Triple Square × Root 2	
728	Subtrahend = 728 Reſolvend	

The PROCESS.

Firſt, make a Dot over every 4th Figure, *viz.* over the 8 and 1.

2dly. Seek the neareſt Root to the firſt Point 1, (as you did in the Square Root,) and it is 1; which put in the Root or Quotient, and place it alſo under the 1 in the 1ſt Point, and ſubtract it there from which is (0) in this Example.

3dly. Take down the Figures in the next Point, *viz.* 728, and call that the Reſolvend.

4thly. Triple the Root, Figure 1, and place it under the Tens Place of the Reſolvend, and call it the triple Quotient 3.

5thly. Square the Root or Quotient 1, and then triple that Square, and ſet it one Place more to the left Hand, and call it the triple Square 3.

6thly

6thly. Add theſe two together as they ſtand, and it makes 33 for a Diviſor.

7thly. Aſk how many Times 33 the Diviſor may be had in the Reſolvend 728, rejecting the laſt Figure 8, (as in the Square Root,) *viz.* 72, and it will be 2, which alſo place in the Root.

8thly. Cube this laſt Root Figure, which will be 8, and place it under the Unit Place of the Reſolvend.

9thly. Multiply the Square of the Figure laſt put in the Root (*viz.* 4) into the triple Quotient 3, which is 12, and ſet it one Place more to the left Hand, as in *Multiplication*.

10thly. Multiply the triple Square 3 by the Root 2, and ſet it one Place more to the Left.

11thly. Add theſe 3 Numbers together, and call them the Subtrahend 728.

12thly. Subtract the Subtrahend from the Reſolvend, and if any Thing remains, and there be any more Figures or Points, bring them down by the Side of the Remainder, and call it New Reſolvend, and proceed in every Reſpect as before.

2. I demand the Cube Root of 185193 ? *Anſ.* 57.

Another Way to extract the Cube Root.

3. I demand the Cube Root of 103823 ? *Anſ.* 47.

The WORK.

103823	47 Root, *Anſ.* **	
64		
39823	Reſolvend or Dividend	
4800	Diviſor	
Add 33600	= 4800 × 7	
5880	= 7 × 7 × 4 × 30	
343	The Cube of 7	
39823	Subtrahend = the Dividend	

** RULE *and* PROCESS.

1. Point off every 4th Figure as before, and find the greateſt Cube of the 1ſt Point 103, which is 4, whoſe Cube is 64, and place it under as before.

2. Subtract 64 from 103, and to the Remainder take down the 2d Point or Period, and it will be 39823 for a Dividend or Reſolvend.

3. Square the Root Figure 4, and multiply it by 300, and place it under the Dividend or Reſolvend for a Diviſor.

4. Seek how many Times the Diviſor is contained in the Dividend, which here is 7, and place this alſo in the Root, by the Side of the 4.

5. Multiply the Diviſor by this Root Figure 7, and place it under the Diviſor, *viz.* 33600.

6. Square the laſt Figure in the Root, and multiply the Square by the 1ſt Figure, (or Figures, if more than 1,) and then by 30, and place this under the laſt, Units under Units, *viz.* 5880.

7. Cube the laſt Figure, which is 343, and place it under the laſt.

8. Add theſe 3 together as they ſtand, and call the Sum the *Subtrahend*, which will be equal to the Reſolvend 39823; ſo is the Work finiſhed.

Laſtly. If there had been a Remainder and more Figures, or Points, to take down, bring the next Period down and proceed as before, only now remember you work with the 2 firſt Figures in the Root, inſtead of the 1ſt only, *&c.*

Sch. I like this Way very well.

Maſt. In ſome Caſes it is eaſieſt; but you may take which you pleaſe.

More EXAMPLES.

4. What is the Cube Root of 32461759? *Anſ.* 319.
5. What is the Cube Root of 259694072? *Anſ.* 638.
6. What is the Cube Root of 5213714904? *Anſ.* 1734.
7. What is the Cube Root of 219365327791? *Anſ.* 6031.

8. What

8. What is the Cube Root of 9423479350146861 ? *Anſ.* 211221.

1 *Note.* If there be Decimals, it is done the ſame, only mind to prick off right.

9. What is the Cube Root of 32.461759 ? *Anſ.* 3.19.

2 *Note.* If Cyphers are required to be added, you muſt add 3 Cyphers, 6 Cyphers, 9 Cyphers, &c. increaſing by 3 always.

10. What is the Cube Root of .002. Add Cyphers, dot them off thus 002000000000, and the Anſwer is .1259 + 4383021 remains.

3 *Note.* To extract the Cube Root of a Vulgar Fraction, extract the Root of Numerator and Denominator, gives the Anſwer; but if this cannot be done, reduce the Vulgar Fraction to a Decimal, and proceed as in the laſt Example.

The USE *of the* CUBE ROOT.

1. There is a Piece of Timber 45 Inches long, 27 Inches wide, and 23 Inches deep; how many ſolid Inches and Feet does it contain ? *Anſ.* 27945 ÷ 1728 = 16 ſolid Feet and 297 ſolid Inches.

2. A Gentleman has a Cellar dug 20 Feet long, 17 Feet wide, and 8 Feet deep; how many ſolid Feet were taken out of it. *Anſ.* 2720 ſolid Feet.

3. There is a cubical Stone, whoſe Content is 19683 Inches, I demand the Area or ſuperficial Content of any Side ? *Anſ.* 729.

4. There is a Globe whoſe ſolid Content is 103823; I demand the Side of that Cube which ſhall be equal in Solidity to the given Circle.

Note 4. All ſimilar or like Solids are in Proportion to each other as the Cube of their Sides, Diameter, &c. therefore,

As the Cube of the given Side or Diameter is to its Weight, ſo is the Cube of the other Side to its Weight required.

5. There is a Bullet 3 Inches Diameter, and weighs 4 lb. I demand the Weight of a Bullet whoſe Diameter is 6 Inches ? *Anſ.* 32 lb.

First cube the Diameter of each; then ſay, As the Cube of the Diameter of the given Bullet is to its Weight, ſo is the Cube of the other to its Weight required.

Note 5. From hence it appears, that a Pipe or a Cube, whoſe Diameter only is as large again as another, will diſcharge 8 Times the Water in the ſame Time as the ſmaller Pipe, that is, the Solidity is 8 Times as much, whereas to Perſons unacquainted with theſe Things it appears to be only as much again — See the 2 next Examples which were put in Practice not far from *London*.

6. A certain Company agreed with another Company to have 2 Pipes fixed in the River, the Bore of each to be 4 Inches Diameter; but afterwards this Agreement was made void, and they were to have one Pipe only of 8 Inches Diameter; I demand who were Gainers by the Bargain; or which diſcharged moſt Water, the two Pipes of 4, or the one of 8 Inches Bore? *Anſ.* The Pipe of 8 Inches Bore diſcharged 4 Times the Quantity of both the other; for $4 \times 4 \times 4 = 64 \times 2 = 128$ cubic Inches only; but $8 \times 8 \times 8 = 512$ Inches $= 128 \times 4$. Thus was one Company deceived or over-reached by the Cunning of the other, or rather their own Ignorance.

7. A Farmer, being out of Hay, went to another Farmer in the Neighbourhood, who had ſeveral large Stacks, and begged he would lend him 10 ſolid Feet, and he would pay him 5 Feet in a Week's Time, and 5 Feet the Week following: No, ſays the covetous Griper, (thinking to make an Advantage of his poor Neighbour,) if you will ſend me back 5 Feet every Week for 4 Weeks, I'll lend it you: The other ſaid it was hard, but as he wanted it he muſt agree to it; accordingly he had the Hay and paid it, as agreed to. I demand how many Feet were lent, and how many paid, and who was the Sufferer? *Anſ.* The covetous Lender was Sufferer, for he had but $\frac{1}{2}$ his Hay back again, though he thought he had as much again. For $10 \times 10 \times 10 = 1000$ Feet; and $5 \times 5 \times 5 = 125$: Now $125 + 125 + 125 + 125 = 500$ only.

6. There is a Ship of 300 Tons Burthen, whoſe Keel is 75 Feet long, Breadth of the Beam 29.5 Feet, and Depth of the Hold 14 Feet; I demand the Length, Breadth, and Depth of another Ship of the ſame Mould, whoſe Burthen is to be 500 Ton? *Anſ.* Length 88.9 Feet, Breadth 35.75 Feet, and Depth 16.3 Feet.

To

To find 2 mean Proportionals between two Numbers?

Rule. Divide the greater Number by the leſs, and extract the Cube Root of the Quotient; which Root multiply by the leſs Extremes, gives the leſs Mean; and this Product into the Root again, gives the greater Mean.

7. I demand what are the 2 true mean proportional Numbers between 9 and 576? *Anſ.* 36 and 144. For $576 \times 9 = 5184$, and $144 \times 36 = 5184$.

Thus have I given you ſufficient Examples.

SECT. XXXI.

Containing a Variety of uſeful and practical Queſtions, to exerciſe the foregoing Rules.

1. WHAT Number is that, which, if divided by 245, will produce 1764? *Anſ.* 432180.

2. What Number is that, which, if multiplied by 245, will produce 432180? *Anſ.* 1764.

3. In 57 Crowns how many Shillings, Pence, and Farthings? *Anſ.* 285*s.* 3420*d.* and 13680*far.*

4. In 42848 Farthings how many Pence, Crowns, and Pounds? *Anſ.* 10712*d.* 178 *Crowns*, and 2*s.* 8*d.* and 44*l.* 12*s.* 8*d.*

5. I demand how many Crowns, Half-Crowns, Shillings, and Pence, of each an equal Number, will pay a Debt of 133*l.* 18*s*? *Anſ.* 312 of each.

6. In a Year (*viz.* 365 Days 6 Hours) how many Minutes? *Anſ.* 525960.

7. Bought 12 Firkins of Butter, each 56 lb. which coſt me 11*l.* 4*s.* what is it per lb.? *Anſ.* 4*d.*

8.* A General laid out £ 6000 to cloath 1480 Men; I demand what the Cloathing of each coſt? *Anſ.* 4*l.* 1*s.* and 3 *farth.*

9. If 5 Ells of Holland coſt 1*l.* 13*s.* how much will 16 Pieces, each 27 Ells, coſt, at that Rate? *Anſ.* 118*l.* 16*s.*

10. A Linen-Draper laid out 82*l.* 10*s.* in fine Cambric; there were 5 Rolls or Pieces, each 22 Yards long; what did it coſt him *per* Yard? *Anſ.* 15*s.*

11. A Woollen-Draper bought of a Clothier 8 Bales of Cloth, each contained 6 Pieces, and each Piece 27 Yards, and gave 16*l.* 4*s.* for every Piece; I demand what the Whole coſt, and what it coſt per Yard? *Anſ.* The Whole coſt 777*l.* 12*s.* and 1 Yard coſt 12*s.*

12. A Perſon becomes a Bankrupt and owes in all 2980*l.* 11*s.* 8*d.* but his Effects amount only to 931*l.* 8*s.* 7$d\frac{3}{4}$; I demand what the Creditors will receive in the Pound? *Anſ.* 6*s.* 3*d.*

13. Bought 3 Hhds. of Tobacco, each weighing 13 cwt. 1 qr. 19 lb. which coſt 281*l.* 16*s.* 3*d.* I demand what this is *per* lb? *Anſ.* 15*d.*

14. A Gentleman has an Eſtate of 424*l.* 7*s.* 2$d\frac{1}{4}$, and his Expences every Day, one with another, are 13*s.* 11*d.* I demand what he ſaves, or lays up, at the Year's End? *Anſ.* 170*l.* 7*s.* 7$d\frac{1}{4}$.

15. A Gentleman ſtands daily at the Charges of 2*l.* 15*s.* 9*d.* and at the Year's End lays up 340*l.* what is his yearly Eſtate? *Anſ.* 1357*l.* 8*s.* 9*d.*

16. An Engliſh Man of War took a Spaniſh Prize worth 5440*l.* There were 320 Sailors beſides the Captain, who had $\frac{1}{5}$ of the Prize, and every Sailor had equal Share alike of the Remainder. I demand the Captain's and each Sailor's private Share? *Anſ. The Captain had* 1088*l.* *and each Sailor* 13*l.* 12*s.*

17. What is the Intereſt of 457*l.* 14*s.* 6*d.* for 2 Years 6 Months at 5*l.* per Cent. per Annum? *Anſ.* 57*l.* 4*s.* 3$d\frac{3}{4}$.

18. An Uſurer put out 750*l.* for 12 Months, and then recovered Principal and Intereſt together 810*l.* I demand what Rate per Cent. he received for Intereſt? *Anſ.* 8*l.* per Cent.

19. If a Cwt. of Cinnamon coſt 59*l.* 14*s.* 8*d.* and 76 lb. of Mace coſt 40*l.* 10*s.* 8*d.* I demand what they coſt per Ounce, one with the other? *Anſ.* 8*d.*

20. A Lady by Will left a particular Acquaintance of hers a very rich Cabinet valued at 400*l.* with all the Effects in it; the Cabinet contained 32 Drawers, each of which had a Purſe of 100 Guineas; the Lady to whom this Legacy was left had in the Bank 1000*l.* and

240*l.*

240 *l.* in Caſh at Home ; I demand her Fortune ? *Anſ.* 5000 *l.*

21. What is the Value of 148 Pieces of Holland, each 24 Ells long, at 4 *s.* 2 *d.* per Yard ? *Anſ.* 925 *l.*

22. How many Gallons of Brandy, at 8 *s.* 4 *d.* per Gallon, may I have for 148 Pieces of Holland, each 24 Ells, at 4 *s.* 2 *d* per Yard ? *Anſ.* 2220 Gallons.

23. A Perſon purchaſed 478 *l.* in a public Stock, which continued 15 Years before he demanded Principal or Intereſt, and then he received Principal and Intereſt 836 *l.* 10 *s.* I demand the Rate per Cent. he received Intereſt ? *Anſ.* 5 *l.* per Cent.

24. What Part of 50 is $\frac{5}{8}$ths. *Anſ.* $\frac{1}{80}$.

25. A Linen-Draper bought a Quantity of Iriſh and Holland together, which coſt him 148 *l.* 10 *s.* the Quantity of Iriſh was 540 Yards, at 3 *s.* per Yard ; and he had $\frac{1}{2}$ as much Holland as Iriſh : I demand what the Holland coſt in all ? and what it coſt per Yard ? *Anſ. The Holland coſt* 67 *l.* 10 *s. at the Rate of* 5 *s. per Yard.*

26. A bought of B 2 Pieces of Ivory ; the one was 14 Inches long, 7 Inches wide, and 2 Inches thick ; the other was 16 Inches long, 5 Inches wide, and 3 Inches thick : I demand how many Dozen of Dice, each $\frac{1}{4}$ of an Inch every Way, may be made of them ? *Anſ.* 581 *Doz.* $\frac{1}{3}$ *or* 4 *over.*

27. How many Crowns, Half-Crowns, Shillings, Sixpences, Three-pences, Pence, Halfpence, and Farthings, of each an equal Number, will pay a Debt of 70 *l.* 9 *s.* $4\frac{1}{2}$ *d.* *Anſ.* 150 of each.

28. A Grocer laid out 26 *l.* 16 *s.* 8 *d.* for 5 cwt. of Tobacco, *viz.* at 9 *d.* 10 *d.* 12 *d.* and 15 *d.* per lb. to have an equal Quantity of each ; I demand what Quantity he had of each Sort ? *Anſ.* 140 lb.

29. What is gained in laying out 500 *l.* if 1 *s.* brings me in 16 Pence ? *Anſ.* 166 *l.* 13 *s.* 4 *d.*

30. A Perſon becomes a Bankrupt for 1187 *l.* 8 *s.* and all his Effects amount only to 445 *l.* 5 *s.* 6 *d.* I demand what this will pay in the Pound ? *Anſ.* 7 *s.* 6 *d.*

31. Bought a Quantity of Paper for 580 *l.* and 3 Months after ſold it for 649 *l.* 12 *s.* I demand what I gained per Cent. by it ? *Anſ.* 12 *l.* per Cent.

32. Two

32. Two Men, A and B, depart from one Place; A ſets out 8 Days before B and travels 15 Miles a Day, and then B ſets out and travels 20 Miles a Day; I demand in how many Days B will overtake A, and how far they both have travelled? *Anſ.* B *overtakes* A *in* 24 *Days, and both have travelled* 480 *Miles.*

33. Two Travellers, A and B, depart from one Place, but quite contrary Ways; A goes 14 Miles a Day and B 17 Miles a Day; I demand how far they are diſtant from each other a Week after their firſt ſetting out? *Anſ.* 217 *Miles.*

34. Two Men, A and B, ſet out to travel by Agreement for 12 Days; the firſt Day they went both 20 Miles very lovingly, but B complained he could not go at that Rate, therefore they took their own Pace; A went 17 Miles a Day, and B 12 Miles a Day; I demand how far, or what Diſtance A was before B, or the ſame how far B was behind A? *Anſ.* 55 *Miles apart.*

35. A Gentleman has an Eſtate, but with Taxes and other Charges ſtands at the Expence of 19*s.* 4*d.* per Day, but at the Year's End lays up 147*l.* 3*s.* 4*d.* I demand his Eſtate? *Anſ.* 500*l. a Year.*

36. If 12 Men dig a Trench for 500 Men in 20 Days, in how many Days may 60 Men do the ſame? *Anſ.* In 4 Days.

37. If when Flour is ſold for 18 Pence per Peck, the Peny Loaf weighs 10 oz. 13 dwts. 8 grs. what ought it to weigh when the Flour is 2*s.* per Peck? *Anſ.* 8 oz.

38. How many Yards of Matting, $\frac{1}{2}$ Yard wide, will cover a Paſſage 20 Feet long and 6 Feet broad? *Anſ.* 26 *yds.* 2 *f.*

39. If 20 Acres of Graſs be mowed by 8 Men in a Week, how many Acres may be mowed by 48 Men in a Fortnight? *Anſ.* 240 Acres.

40. How many Tiles, 10 Inches long and 8 wide, will cover a Floor or Side Wall 22 Feet long and 15 Feet broad? *Anſ.* 594.

41. What Number or Fraction is that which multiplied by $\frac{3}{5}$ will produce Unity or 1 only? *Anſ.* $\frac{5}{3}$.

42. What Number is that which being multiplied by $\frac{3}{5}$, will produce the ſame Number as there are Farthings in a Pound? *Anſ.* 1600.

43. If $\frac{5}{6}$ of a Yard coſt $\frac{2}{3}$ of a Pound Sterling, what coſt $\frac{1}{3}\frac{1}{2}$ of a Yard? *Anſ.* $\frac{8}{2\frac{4}{0}}$, or 8*d.*

44. If $\frac{1}{3}$ of an Ounce coſt $\frac{7}{8}$ of a Shilling, what coſt $\frac{5}{6}$ of a Pound? *Anſ.* 1*l.* 15*s.*

45. A Perſon left an Eſtate of 3000*l.* to his 3 Daughters, A, B, and C; in ſuch a Manner that every 3*l.* that A had, B was to have 5, and C 8; I demand the Share of each? *Anſ.* A 562*l.* 10*s.* B 937*l.* 10*s.* and C 1500*l.*

46. What is the Product of £. 24.25 or 24*l.* 5*s.* by £ 8.25 or 8*l.* 5*s*? *Anſ.* 200*l.* 1*s.* 3*d.*

47. Divide £ 1063.89825 by £ 41.7215? *Anſ.* £ 25.5 = 25*l.* 10*s.*

48. What is the Product of £ 41.7215 by £ 2.55? *Anſ.* £ 106.389825.

49. Divide £ 200 by £ 24.25. *Anſ.* £ 8.25 = 8*l.* 5*s.*

50. Bought 148.275 Yds. of Cloth, which coſt me .175 of a Pound per Yard; what did they come to? *Anſ.* 25*l.* 18*s.* 11$\frac{1}{2}$*d.*

51. What preſent Money will diſcharge a Debt of 450*l.* 10*s.* due 9 Months to come at 15 per Cent. or what muſt I have for prompt Payment, *viz.* paying my Money 9 Months before it is due? *Anſ. Preſent Money is* 434*l.* 4*s.* 4*d. and the Re ate for prompt Payment* 16*l.* 5*s.* 8*d.*

52. A advanced the Sum of 450*l.* 10*s.* for B upon a Building Leaſe to be paid in 5 Years Time after the Rate of 6*l.* per Cent. compound Intereſt; I demand what the Principal and Intereſt amount to in that Time? *Anſ.* The Principal and Intereſt will be 602*l.* 17*s.* 4$\frac{3}{4}$*d.* and the Intereſt only 152*l.* 17*s.* 4$\frac{1}{4}$*d.*

53. Two Partners, A and B, enter into Partnerſhip, and between them bought 20 Bags of Hops, which coſt £. 200, of which A paid 120*l.* and B 80*l.* and they gained by them 50*l.* I demand the Share of each in the Gain? *Anſ.* A's *Share of the Gain is* 30*l. and* B's 20*l.*

54. Three Partners, A, B, and C, buy a Ship jointly, and afterwards freight her for a Voyage: A put in 234*l.* B put in 351*l.* and C put in 702*l.* and upon her Return having made up their Accounts, they find the gain 792*l.* I demand the Share of each? *Anſ.* A 144*l.* B 216*l.* and C 432*l.*

55. Two Partners enter into Trade; A put in 200*l.* for 6 Months, B put in 750*l.* for 4 Months; after which they ſettle and find they gained 700*l.* I demand the Share of each in Proportion to his Stock and Time? *Anſ.* A's Share is 200*l.* and B's 500*l.*

56. A Mealman mixes 40 Buſhels of Meal at 5*s.* with 72 at 3*s.* with 80 of 2*s.* per Buſhel: I demand what a Buſhel of this Mixture is worth? *Anſ.* 3*s.*

57. A Grocer mixes 4 Sorts of Tea, ſome of 4*s.* 3*d.* ſome of 6*s.* 9*d.* ſome of 7*s.* 6*d.* and ſome of 5*s.* per lb. ſo as to make a Mixture which may be worth 6*s.* per lb. how many Pounds of each muſt he take? *Anſ.* 9 lb. of 4*s.* 3*d.* 21 lb. of 6*s.* 9*d.* 12 lb. of 7*s.* 6*d.* and 18 lb. of 5*s.*

58. A and B barter; A ſells B 160 Dozen of Candles at 4*s.* 6*d.* per Dozen, and B pays him 15*l.* in Part, and he is to have the Remainder of the Debt in Tobacco at 8*d.* per lb? I demand how much Tobacco A muſt have? *Anſ.* 5 cwt. 2 qrs. 14 lb.

59. How many Buſhels of Wheat at 4*s.* 2*d.* per Buſhel may I have for 48 Ells of Holland at 3*s.* 4*d.* per Yard? *Anſ.* 48 Buſhels.

60. A and B barter; A has broad Cloth worth 14*s.* per Yard ready Money, but in Barter he will have 15*s.* 6*d.* B has Hops worth 4*l.* 18*s.* per cwt. ready Money; what muſt he advance his Hops per cwt. to equal the Advance of A's Cloth in Barter. *Anſ.* To 5*l.* 8*s.* 6*d.* per cwt. ſo that the Advance is 10*s.* 6*d.* per cwt.

61. How many Palamo-florins at 15*d.* each muſt I receive for a Bill of 175*l.* Sterling? *Anſ.* 2800.

62. A Church-warden made a Rate for Diſburſements in repairing the Church, which amounted to the Sum of 93*l.* 15*s.* the Amount of the Rents of the Pariſh is 2500*l.* I demand what his Rate muſt be in the Pound to raiſe what he diſburſed, and what a Farmer muſt pay who rents 100*l.* a Year. *Anſ. The Rate is* 9*d. in the Pound, and the Farmer pays to it* 3*l.* 15*s.*

63. A Farmer agreed with a Labourer to threſh him 100 Buſhels of Wheat and Barley, and to give him 3*d.* per Buſhel for the Wheat and 2½*d.* per Buſhel for the Barley; when the Whole was done he received 1*l.* 2*s.* 6*d.* I demand how many Buſhels of each he threſh'd? *Anſ.* 40 *Buſhels of Wheat and* 60 *Buſhels of Barley.*

64. Three School-boys, A, B, and C, were talking about their Ages, ſays B to A, I am juſt half as old again as you; ſays C to B, and my Age is juſt half the Sum of both yours; well ſays A, I remember I heard my Maſter ſay, who is now 46, that he is one Year older than all of us: I demand the Ages of A, B, and C? *Anſ.* A *is* 12, B 18, *and* C 15.

65. What Number is that which having 24 added to it, and 17 taken out of that Sum, then the Remainder being multiplied by 6, and that Product divided by 8, the Quotient will be 39? *Anſ.* 45.

66. A Perſon dying left 2 of his Acquaintance, A and B, a certain Number of Queen *Ann*'s Crown-pieces; now had he left 10 Crowns more to A, and 10 leſs to B, then A would have had 5 Times as many as B; but had he left 10 leſs to A, and 10 Crowns more to B, then both would have had an equal Number: I demand how many each had left him? *Anſ.* A *had* 40, *and* B 20.

67. As I was beating on the Champaign Grounds,
Up ſtarts a Hare before my two Greyhounds:
The Dogs being light of Foot did fairly run,
Unto her 18 Rods juſt 21:
The Diſtance that ſhe ſtarted up before,
Was meaſured 90 Rods, nor leſs nor more:
Now this I'd have you unto me declare,
How far they run before they caught the Hare?
Anſ. 320 *Roas.*

68. I demand the Square Root of 36481? *Anſ.* 191.

69. I demand a mean proportional Number between 50 and 70? *Anſ.* 59.16 + 944.

70. A Ship ſails from a certain Port, and after arrives at another Port 400 Minutes Difference of Latitude, and her Departure is 300 Degrees: I demand her Diſtance from the firſt Port? *Anſ.* 500 Minutes.

71. There is a Tower, which has a Spire ſtanding in the Middle, the Tower itſelf is 125.11 Feet high, and from the Center of the Spire to the Edge of the Verge of the Tower is 30 Feet, and from the Top of the Spire to the ſaid Verge of the Tower 100 Feet: I demand the Height of the Spire ſeperately, and the whole height from the Ground. *Anſ. The Spire is* 95.39 Feet.
Both together 220.5 Feet.

72. There is a Parallelogram or long Table, whoſe Length is 10.125, Feet and Breadth, 8 Feet: I demand what muſt be taken off from the Length, and what added to the Breadth to make it a Square Table?

Anſ. 1.125, *viz.* 1 *Foot* $1\frac{1}{2}$ *Inch muſt be taken from the Length and* 1 *Inch added to the Breadth to make it a Square Table for* $9 \times 9 = 10.125 \times 8 = 81$ *the Content.*

73. There is a Circle whoſe Area is 1357.25 I demand the Side of a Square equal thereto? *Anſ.* 36.84 + 644 *Remainder.*

74. At the coming over of the Palatines there were a certain Number lodged in an Out-Building and a Subſcription was opened, and there was gathered for them, 3*l.* 15*s.* and it was agreed to give every one of them as many Pence a-piece as there were Perſons in Number: I demand the Number of Perſons and how much each had?

Anſ. 30 Palatines, 30 Pence each?

75. What is the Square Root of .00125? *Anſ.* .015.

76. What is the Square Root of $\frac{1}{4}$? *Anſ.* $\frac{1}{2}$.

77. What is the Square Root of 3?

Anſ. 1.732 + 176 *Rem.*

78. What is the Cube Root of 1875? *Anſ.* 15.

79. I demand the Cube Root of 2924307? *Anſ.* 143.

80. There is a Sphere or Globe whoſe ſolid Content is 76.765625: I demand the Side of a Cube whoſe Solidity ſhall be equal to that of the Sphere or Globe?

Anſ. 4.25 *or* $4\frac{1}{4}$.

81. There is a Shot or Bullet whoſe Diameter is 4 Inches and weighs 18 lb. I demand the Weight of another Bullet of the ſame Caſt or Metal whoſe Diameter is 6 Inches? *Anſ.* 60.75 + $60\frac{3}{4}$ lb.

82. There is a Shot 4 Inches Diameter and Weight 18 lb. I demand the Weight of one of the ſame Sort 3 Inches Diameter? *Anſ.* 7.59575 lb. = 7lb. 9 oz. 8 drms.

83. There are 2 Shots or Cannons, one is 4 Inches Diameter, and weighs 18 lb. and the other weighs $60\frac{3}{4}$ lb. I demand its Diameter? *Anſ.* 6 Inches.

84. There are 2 Shots one of 4 Inches Diameter, and weighs 18 lb. the other weighs 7 lb. 9 oz. 8 drms. I demand its Diameter? *Anſ.* 3 Inches.

2. *Here follows ſome critical and ſpeculative Queſtions, which (though they fall not under any one particular Rule, nor are immediately neceſſary in Trade or Buſineſs, yet) are very proper to exerciſe the Mind of every Pupil that would make himſelf Maſter of* Arithmetic.

N. B. Before I begin theſe Queſtions, I think it may not be amiſs to take Notice of the different Opinions of various Tutors and School-maſters; ſome ſay, that nothing difficult ſhould be offered to young Pupils, becauſe it damps and diſcourages their little Minds, and hinders their Purſuit of, and Progreſs in Learning.—Others affirm, that it is impoſſible to make a Pupil Maſter of any Branch of Learning, except he be often puzzled.—Now, though I do not pretend to determine this Matter, by Way of dictating to them, who have the Care of Youth (as it would be impoſſible to chime in with all) yet I would beg leave to ſay, that both Aſſertions may be right, and that both Sort of Tutors may be very well juſtified in their different Methods of Teaching: For 1ſt. As it is univerſally agreed, that no Tutor nor Maſter can be too plain in teaching the firſt four Rules of *Arithmetic* and the *Rule of Three*, neither can any Scholar be too perfectly grounded in them; becauſe they are the Baſis of all preceding Rules: So, 2dly, after it is granted that the Scholar is perfect in theſe, it will then be high Time to exerciſe his Mind in Things which require ſome Thought and Conception, and therefore to ſet him Queſtions too eaſy, is only infringing both upon his Time and Capacity; for ſuch aſpiring Youths ſhould certainly be encouraged and ſet forward in their Purſuit, and have other Sort of Queſtions ſet them than what they can immediately execute with Eaſe.—I ſay, that it is the ſame with Learning as in any mechanical Trade, when any Apprentice is perfect in ſuch and ſuch a Part of his Buſineſs; if his Maſter ſtops him there, he will never be a practical Workman, till he both ſees and executes ſomething in a more maſterly Manner.—It is therefore on this Account, I have thought it really neceſſary to propoſe the following Queſtions, to exerciſe the Minds of ſuch who are already perfect in all the foregoing Rules, and as for thoſe young *Tyro*'s who are not acquainted with *Arithmetic* in general, I take it for grant that no wiſe Tutor would offer to propoſe Queſtions of this Sort to them, till *he* himſelf firſt is capable to anſwer them very readily, and is as ready and willing to aſſiſt his Pupil.—And as for ſuch Perſon, whoſe Bent or Inclination is ſet upon Variety, it will ſerve as proper Exerciſes for them at Intervals, and be no doubt of great Service.

More Examples for Trial.

1. What muſt be added to the Square Root of 3 to make it equal to the Square Root of its Remainder (which is to

be called whole Numbers) both being extracted to a Decimal of three Places? *Anſ.* 11.534.

2. Suppoſe 4 Times 8 be (or produce) 32; how much then will the Square of 15 be? *Anſ.* 18.

3. A Linen-Draper bought 2000 Yards of Dowlas, for which he was to pay 93*l.* 15*s.* but by his paying ready Money was allowed 2*l.* 1*s.* 8*d.* I demand what it coſt per Yard? *Anſ.* 11*d.* $\frac{1}{4}$.

4. What is the Difference between the Number of Hour-Strokes which a Clock ſtrikes in a whole Day, and the Square Root of 24336? *Anſ.*

5. Two Travellers, A and B, ſet out to travel round an Iſland, 80 Miles in Circumference, A goes 20 Miles a Day, and B goes 15, and they both agree to travel in this Manner till they meet together again: I demand in what Time they will meet together, how far each has travelled, and how many Times they went round the Iſland?

Anſ. They met together again in 72 *Days, and then A had been* 4 *Times round the Iſland, or* 320 *Miles; and B had been* 3 *Times round it, or* 240 *Miles.*

6. There was a Bridge built over a large River from County to County, which by the Eſtimation of the Workmen came to the Sum of 65,520*l.* and there were Commiſſioners appointed to receive a Toll of the Paſſengers as follows, *viz.* for every 4 wheel Carriage 4*d.* for every 2 wheel Carriage 3*d.* for every Horſeman 1*d.* and for every Foot Paſſenger an Half-penny. Now at the End of the firſt Month or 28 Days, the Toll-keepers collected juſt 760*l.* and had taken Notice that as often as 3 paſſed over in 4 wheel Carriages, 8 paſſed over in 2; and as often as 1 paſſed over in a 4 wheel Carriage, 10 paſſed over on Horſeback and 10 Times that Number on Foot: The Queſtion is how many paſſed over of each Sort in the Month?

Anſ. 2400 *4 wheel Carriages,* 6400 *2 wheel Carriages,* 24000 *on Horſeback and* 240000 *on Foot:* For 240000 Half-pence + 24000 Pence + 6400 Three-pences + 2400 Groats = 760*l.*

7. A Man and his Wife had 3 Sons, A, B and C in their Order as follows, *viz.* B was 3 Times as old as C, and if B's Age was multiplied by the Square Root of the Age of A, it would give the Father's Age, and if the Ages of B and

and C were multiplied together, it would equal the Age of the Mother: Now the Ages of the Father and Mother were 108, and all their Ages 149; I demand the Age of each ſeperately?

Anſ. The eldeſt A was 25, *B* 12, *C* 4, *the Father* 60, *the Mother* 48.

8. A Jack Tar dying on Ship-board, left 177 *l.* to 6 of his Comrades (A, B, C, D, E and F) his Ship-Mate and his Widow, as follows: To A a certain Sum, to B 2 *l.* 10 *s.* more, and ſo on, every one to have 2 *l.* 10 *s.* more, to the Ship-Mate he left the Double of all their Legacies, and to his Widow 40 *l.* 10 *s.* leſs than to the Ship-Mate. I demand the Share of each?

Anſ. A 1 *l. B* 3 *l.* 10 *s. C* 6 *l. D* 8 *l.* 10 *s. E* 11 *l. F* 13 *l.* 10 *s. the Ship-Mate had* 87 *l. and his Widow* 46 *l.* 10 *s.*

9. A young Country Squire came to *London*, and having more Money than Wit, went to *White*'s where he met with 4 noted Gamblers, A, B, C and D, with whom he ſat down ſeparately to play Cards, A won half what he had got in his Pocket, and genteely returned him back 20 Guineas; then he played with B for half he then had, who beat him and civilly returned the Squire back 10 Guineas; then C beat him juſt the half of what he had left, and kindly returned him back 5 Guineas, and laſt he played with D till he loſt half what he then had left, and he alſo returned him back 5 Guineas; then our young Squire thought proper to leave off, and upon telling his Money, found he had juſt 25 Guineas left: I demand what Sum he had when he ſat down to play, and what he loſt in all?

Anſ. He had 210 *l. when he began, and loſt* 183 *l.* 15 *s.*

PART II.

CONTAINS

A SHORT and EASY SKETCH

OF

BOOK-KEEPING:

So properly adapted to the Capacities of YOUTH, that they may ſoon learn to keep any *common Accompts* of ſimple DEBTOR and CREDITOR with great *Eaſe* and *Exactneſs*.

1. OF all the Branches of Learning, none certainly has been more neglected, nor leſs attended to, than the common Method of *Book-keeping*, both by adult and young Perſons; for it has been a Complaint of a very long ſtanding, and the Neglect of not teaching Youth ſomething of this neceſſary Branch of Knowledge has been much wondered at

2. It may be objected by ſome Maſters and Teachers, that what ſignifies learning Youth to keep common Accompts

compts, without the Parents conſent that they ſhould learn it according to the *Italian* Method, namely, by *double Entry*, commonly called or known by the Name of MERCHANTS ACCOMPTS; but this is a vague Way of talking, for I may as well ſay, what ſignifies learning Youth the firſt four Rules of *Arithmetic*, the *Rule of Three*, *Practice*, &c. excepts he learns *Algebra*; whereas every Body knowst hat a Perſon may be a very good *Arithmetician*, and perform every Thing readily for any Buſineſs, without *Algebra*; though he cannot do abſtruſe and critical Queſtions in *Geometry*, &c. without it.

Thus by the ſame Rule, though a Perſon cannot keep large Accompts of Merchandiſe without double Entry; yet he may keep common Accompts of ſimple *Debtor* and *Creditor* very exact by ſingle Entry only.

3. It is plain then, that the Errors of common Tradeſmen and Artificers, ſuch as *Butchers*, *Bakers*, *Blackſmiths*, *Tailors*, &c. &c. do not ſo much lie in their keeping Accompts by *ſingle* Entry only, but becauſe in general they keep no Account at all, or a partial, falſe, or neglectful Book; for it is evident, that if any Perſon ſets down all that he buys and ſells, and what he receives and pays for (though it were but in *one* common Day Book only) his Accompts would be juſt in reſpect to his Circumſtances in Trade, though it will be troubleſome to ſettle them, by Reaſon of many different Accompts being intermixed together, yet notwithſtanding this, it would be a juſt and true Account.—But becauſe there ſhould be no Difficulty by Reaſon of the Length and Prolixity of the common Day Book, it is very proper there ſhould be another larger Book provided, called the Ledger; into which every Man's Accompt is to be placed under a ſeparate Head, as will be ſhewn hereafter.

4th. Plain and ſimple as this may appear, yet I will venture to ſay, if it be duly attended to according to its Plan and Deſign (from which any one may vary at Pleaſure) it will be found uſeful, as it is notoriouſly evident, that after Boys have been a long Time at School, and gone through moſt of the Branches of common *Arithmetic*, yet they have not been able to caſt up the Side of a Ledger Account, much leſs then to know how to ſet Articles down in the Day-Book and poſt them up.

5. From

5. From whence then can this Deficiency ariſe? Certainly from having no Inſtruction in it; and ſimple and mean as it may appear at firſt Sight, yet I am fully convinced, that Examples and Exerciſes of this Sort would be very ſerviceable to Youth, and redound much more to the Credit of all Teachers or Tutors in general. For,

6. It is really a Shame, to hear ſuch daily Complaints of the Deficiency of Education, that after Youth have been both at Day Schools and Boarding Schools for Years, and have learnt almoſt every Rule of common *Arithmetic*; yet if they are put to ſettle a plain Accompt, or even to make out, and caſt up a long Bill of various Articles you are certain to find them at a Loſs; the Parent or Maſter is ſurprized, wonders the Lad cannot perform it; and being aſked the Reaſon, the innocent School-Boy naturally makes Excuſe, by ſaying he was never taught ſo *far* (which is very common) or never was taught ſuch a Thing at all.

Laſtly, Is it not then, Gentlemen, highly neceſſary that this neglected Branch of Education ſhould become a Matter of your ſeveral Conſiderations in ſome Reſpect or other? I have given the Hint only, and introduced it imperfectly; but I hope to ſee that ſome of *you*, who have more Time and better Abilities would complete ſo neceſſary a Work.

The DIARY, *or* DAY-BOOK,

Commencing

JANUARY 1ſt, 1765.

Note 1. A Daſh, or ſloping Stroke, placed between the Figures is done for Expedition ſake to part the Shillings from the Pence, thus 4|10, 14|8½ and 19|5, ſignify 4*s.* 10*d.* 14*s.* 8*d.*½ and 19*s.* 5*d.*

Note 2. When you remove the Articles of any Accompt from the Day-Book into the Ledger it is called *poſting*, and after you have wrote each Article to every Man's ſeparate Accompt in due Order, you then make this Daſh or Tick (✓).

Note 3. Between one Day of the Month and another make a Partition, or leave a Line, and then it matters not whether the Day of the Month ſtands in the Margin or in the Middle of the Day-Book.

Note 4. Write the Name of the Perſon at the Beginning of the Margin, and then all the Articles delivered, one after the other, with the Price per Yard, per Ell, per Cwt. or per lb. but you need not caſt them up in the Day-Book till you come to *poſt* them up: Some Articles indeed have a fixed Price, and then the Money is expreſſed.

Note 4. In *poſting* the Articles of the Day-Book into the Ledger, ſome Perſons enter, or make a Line of every Article, other take 2 or 3 more Articles together, and *poſt* them in one Line, according as how wi'e the Paper of the Ledger will allow of: There can be nothing further ſaid, but only this, that Obſervation and Experience will ſoon make the Learner perfect.

Note 5. Ditto or D°. ſignifies the ſame Thing or Price.

January

January 1st. 1765.

✓ *John Andrews*, 14lb. of Soap, at 5*d*.
2lb. of Green Tea, at 14*s*. 2lb. of Bohea, at 6|6
✓ *Thomas Barker*, 1 Piece of Iriſh, 25 Yds. at 2|3, per Yd. 12 Yds. of Check, at 1*s*.
✓ *William Batſon*, 12lb. of Currants, at 5*d*½
14lb. of Raiſins, at 5*d*. 4 Hats, at 7|6
28lb. of Sugar, at 4*d*. 1 Loaf, 9lb. at 8*d*.
✓ *Ann Charlton*. 2 Pieces of Black Ribbon, 12 yds. each, at 5*d*. 2 ditto White, 10 yds. each, at 6*d*. 4 Pieces of ditto flowered, 9 yds of each, at 7*d*.
Caſh taken for Sundries in Retail to Day, 5*l*. 7*s* 6*d*. ½.

2d.

✓ *Richard Davis*, 12lb. of Indico, at 18*d*.
2 large lumps of Sugar, 50lb. at 6*d*.
4 ſingle Loaves 30lb. at 8*d*.
2 double refined 17 ½ lb. at 10*d*.
✓ *Jonathan Edwards*, 6 Dozen of Braſs Buttons.
6 Dozen of Scarlet, at 9*d*.
3 Dozen of Scarlet Waiſtcoat, 8*d*.
⅛th of Blue Velvet, at 16*s*. per Yard.
Caſh taken to Day for Sundries, 2*l*. 14*s*. 7*d*.

3d.

✓ *Nicholas Forſter*, 3 Gallons of fine Lamp Oil, at 3*s*. per Gallon. 2 Gallons of Train Oil, at 2*s*. and a ½ Gallon of Sweet Oil, at 10*s*. 6*d*.
✓ *Abraham Gibſon*, Eſq. 2 Quarts of Ketchup, at 2*s*. 6*d*.
100 of pickled Cucumbers, 15*d*.
Caſh for Sundries to Day 2*l*. 4*s*. 8*d*.

4th.

✓ *Paul Hewitſon*, 3 Ounces of Nutmegs, at 8*d*.
5lb. of Indico, at 20*d*. Ginger, 4*d*. Pepper, 6*d*.
✓ *Edward Jackſon*, 14lb. of Soap, at 6*d*½.
3 ½ Yards of fine blue grey Cloth, at 18*s*.
Caſh taken to Day for Sundries 2*l*. 9*s*. 6*d*. ¼

Poſted Jan.

Jan. 5th. 1765.

✓ *Philip Knapton*, 3 Pieces of Check, *viz.*
17 Yds. at 10*d.*
22 Yds. at 11*d.*
24 Yds. at 13*d.*
16 Ells of Holland, at 4*s.* 9*d.*
4 Yds. of Muſlin, at 3*s.* 4*d.*
6 Yds. of Cambrick, at 7*s.* 6*d.*
Caſh taken to Day for Sundries 3*l.* 9*s.*

7th.

✓ *Charles Longman*, 84 lb. of Raiſins, at 38*s.* per Cwt.
½ Cwt. of Hard Soap, at 2*l.* 5*s.* per Cwt.
2 Quarts of Oil, at 3*s* per Gallon
1 Pint of Sweet Oil, 15*d.*
14 lb. of Rice, at 4*d.*
✓ *Iſaac Mackie*, Eſq. 1 lb. of Tobacco, 18*d.*
2 Bottles of Ketchup, at 2*s.* 6*d.*
2 lb. of Currants, at 5*d.*
Nutmegs, 3*d.* ½.
2 Quarts of Vinegar, 9*d.*
7 lb. of Soap, at 5*d.* ½.
2 Dozen of Eggs, at 4*d.*
Caſh taken to Day for Sundries 4*l.* 3*s.* 11*d.*

8th.

✓ Rev. *Jacob Nelſon*, 2 lb. of Coffee, at 4*s.* 6*d.*
2 Waſh Balls, 10*d.*
1 lb. of beſt Tobacco, at 22*d.*
6 lb. of Raiſins, at 5*d.*
4 lb. of Currants, at 5*d.* ½.
✓ *David Phipps*, 14 lb. of Jar Raiſins, at 7*d.*
2 lb. of Almonds, at 14*d.*
1 Cheſt of Tea, 1 cwt. 2 qrs. at 30*l.* per Cwt.
Caſh taken to Day for Sundries 7*l.* 3*s.* 8*d.*

Poſted *Jan.*

Jan. 9th. 1765.

✓ *Andrew Philips*, 2 Baſkets of *Malaga* Raiſins, 104 lb. at 4*d.*
1 Baſket of Figs, 36 lb. at 7*d.*
4 lb. of Cocoa, at 2*s.* per lb.
40 lb. of Liſbon Sugar, at 6*d.* per lb.
2 Thouſand of ten-penny Nails, at 5/3
✓ *Robert Raymond.* 2 Gallons of Brandy, at 8*s.*
2 Gallons of Rum, at 9*s.* 6*d.*
2 Gallons of Engliſh Gin, at 4*s.* 6*d.*
2 Gallons of Hollsnd at, 9*s.* 6*d.*
1 Gallon of Aniſeed, 4*s.* 6*d.*
1 Gallon of Cinnamon Water, 10*s.* 6*d.*
Caſh taken to Day for Sundries, 2*l.* 17*s.* 10*d.*

10th.

✓ *Thomas Rogers*, 100 Red Herrings, 3*s.* 6*d.*
1 Jar of linſeed Oil, 4 Gallons at 4*s.* 6*d.* per Gallon.
1 Baſket of Raiſins, 50lb. at 4*d.*
60 Pickled Herrings, 5*s.* 6*d.*
1 Qr. Cwt. of Soap at 2*l.* 10*s.*
✓ *William Smythe, Eſq.* 1 Barrel of Anchovies, 3*l.* 5*s.*
2 Bottles of Ketchup, at 2*s.* 6*d.*
14 lb. of Rice, at 5*d.*
Caſh taken for Sundries to Day, 3*l.* 5*s.* 9*d.*

11th.

✓ *Theophilus Smith.* 2 Pieces of Yard wide Iriſh, each 25 Yds. at 18*d.*
1 Piece of Dowlas, 28 Yds. at 10*d.*
1 Ditto Ruſſia Cloth, 22 Yds. at 16*d.*
1 Ditto Check, 19 Yds. at 11*d.*
1 Ditto fine, 20 Yds. at 13*d.*
Caſh taken to Day for Sundries, 7*l.* 4*s.*

Poſted *Jan.*

Jan. 12th. 1765.

✓ Rev. *Charles Smyth.* 2lb. of Chocolate, at 5*s.* 6*d.*
2 lb. of Coffee, at 4*s.*
1 lb. of Hyſon Green 14*s.* 6*d.*
1 lb. of Bohea, 9*s.*
1 Loaf of ſingle refined, 12lb. at 8*d.*
1 ditto double refined, 8 lb. at 11*d.*
Caſh taken to Day for Sundries, 2*l.* 17*s.* 11*d.*

14th.

✓ *Jeremiah Thompſon,* 12 Yds. of Fuſtian, at 2*s.* 3*d.*
2 Dozen of Coat Buttons of the Colour, 14*d.*
2 Ditto Waiſtcoat and Breeches, at 10*d.*
4 Yds. of Frize, at 4*s.* 6*d.*
8 Yds. of Shalloon, at 19*d.*
Caſh taken to Day for Sundries, 3*l.* 9*s.* 5*d* ½.

15th.

✓ *Moſes Walton,* 6 Dozen of Candles, at 6*s.* 4*d.*
1 Piece of Holland, 22 Yds. at 4*s* 2*d.*
1 Ditto Iriſh, 24 Yds. at 2*s.* 3*d.*
7 lb. of hard Soap, at 6*d.*
4 lb. of ſoft ditto, at 5*d.*
12 Yds. of green Baiz, at 16*d.*
Caſh taken to Day for Sundries, 5*l.* 4*s.* 7*d.*

16th.

✓ *Sarah Watſon,* 4 Yds. of black Ribbon at 5*d.* ½.
2 Yds. of green, 2 of blue Ribbon, at 6*d.* ½.
12 Yds. of printed Cotton at 4*s.* 6*d.* per Yd.
¼ lb. of Nutmegs, 2*s.* 6*d.*
Ditto beaten Pepper.
6 lb. of Raiſins, at 5*d.*
4 lb. of Currants, at 6d.
5 Yds. of Check, at 14*d.*
Caſh taken to Day for Sundries, 3*l.* 19*s.* 7*d.* ½.

Poſted.

Jan. 17th. 1765.

✓ *Joſeph Young, Eſq.* 1 lb. of Tea, 14*s.*
2 lb. of Coffee, at 4*s.* 6*d.*
8 lb. of four-penny Sugar
12 lb. of Five-penny
12 lb. of Raiſins, at 6*d.*
3 lb. of Almonds, at 10*d.*
4 lb. of Prunes, at 4*d.* ½.
25 lb. of Malagas, at 4*d.*
14 lb. of Currants, at 5*d.*
Nutmegs, Mace and Cinnamon, 10*d.*
Caſh taken to Day by Sundries, 7*l.* 3*s.*

18th.

✓ *John Andrews,* 12 Yds. of Fuſtian, at 3*s.*
5 Yds. of Shalloon, at 19*d.*
3 Yds. and ½ of broad blue Cloth, at 18*s.*
7 Yds. of Check, at 14*d.*
✓ *Thomas Barker,* 3 Dozen of Candles, at, 6*s.* 4*d.*
40 Yds. of Linen Check for Bed Curtains, at 20*d.*
14 lb. of Soap at 7*d.*
Caſh taken to Day for Sundries, 3*l.* 4*s.*

19th.

✓ *William Baſton.* 1 Cwt. of Liſbon Sugar, at 2*l.* 10*s.*
28 lb. of Raiſins, at 5*d.*
8 lb. of Rice at 5*d.*
14 Yards of Ruſſia, at 15*d.*
Caſh taken to Day for Sundries, 3*l.* 14*s.* 9*d.*

21ſt.

✓ *Ann Charlton,* 3 Pieces of blue Ribbon, 25 yards, at 5*d.* per Yard.
15 Yards of white coloured ditto, at 5*d.* ½.
4½ Yards of Lace, 4|6.
19 Yards of coarſe Lace, 2|6.
2 Pieces of pink Ribbon 20 Yards, at 5*d.*
Caſh taken to Day for Sundries, 2*l.* 11*s.*

Poſted. *Jan.* 22d.

Jan. 22d, 1765.

✓ *Richard Davis*, 14 lb. of Sugar, at 5 *d.*
2 Loaves 17 lb. at 8 *d.*
1 Lump 25 lb. at 7 *d.*
6 lb. of green Tea, at 12 *s.*
12 lb. of Bohea, at 7 *s.*
Caſh taken to Day for Sundries, 3 *l.* 14 *s.*

23d.

✓ *Jonathan Edwards*, 7 Yards of Fuſtian, at 2|3
9 Yards of blue 7 qr. Cloth, at 18 *s.*
12 Yards of Frize, at 4|3.
8 Yards of Serge, at 4 *s.*
3 Dozen of Braſs Buttons, at 20 *d.* per Dozen.
3 Dozen of plain blue, at 9 *d.* per Dozen.
½ Ounce of blue Silk, 16 *d.*
¾ Ditto of various Colours, 15 *d.*
✓ *Nicholas Forſter*, 2 lb. of 10 *s.* green Tea.
1 lb. at 8 *s.*
✓ *Abraham Gibſon, Eſq.* 1 lb. of Chocolate, 5|6
1 lb. of Coffee, at 4|6
2 Gallons of Brandy, at 10 *s.* Ditto of Rum, at 10 *s.*
14 Yds. of Holland, at 4|6.
Caſh taken to Day for Sundries, 6 *l.* 4 *s.* 9 *d.*

24th.

✓ *Paul Howitſon*, 6 dozen of Candles, at 6|8.
14 lb. of Soap, at 6 *d.*
9 Yards of Iriſh, at 2|3.
✓ *Edward Jackſon*, 2 Gallons of Brandy, at 7|6.
1 Gallon of Rum, 9|6.
✓ *Philip Knapton*, 4½ Yards of Sky blue ſuperfine Cloth, at 19 *s.*
5 Yards of Shalloon, at 22 *d.*
Caſh taken to Day for Sundries, 3 *l.* 7 *s.* 7 *d.* ½.

Poſted. *Jan.*

Jan. 25th, 1765

✓ *Charles Longman*, 1 Piece of Doulas, 27 Yards, at 14*d.* per Yard.
7 Ells of Holland, at 5*s.* per Ell.
✓ *Iſaac Mackie, Eſq.* 2 lb. of 6*s.* Bohea.
1 lb. of Coffee, at 4|6.
½ Dozen Pocket Handkerchiefs, at 19*d.*
2 Red and white Ditto 2|3.
✓ *Rev. Jacob Nelſon*, 1 lb. of Bohea, 6|6.
1 lb. of Green, at 14|6.
7 lb. of Salt, 10*d.* ½.
2 Ounces of Mace, 18*d.*
3 lb. of Rice, 9*d.*
Caſh taken to Day for Sundries, 3*l.* 19*s.* 6*d.*

26th.

✓ *David Phipps*, paid a Bill by his Deſire (as per Letter the 15th Inſtant,) to *John Stow*, Wine Merchant, 5*l.* 8*s.* 3*d.*
10 Yards of flowered Cotton for his Daughter, at 3|6.
6 Yards of Check, at 13*d.*
✓ *Andrew Philips*, 14 Yards of Pluſh, at 5|6.
2 Dozen of Coat Buttons, at 14*d.* per Dozen.
1 green Velvet Cap, 7*s.* 6*d.*
Caſh taken to Day for Sundries, 2*l.* 15*s.*

28th.

✓ *Robert Raymond*, 4 Gallons of Brandy, at 8*s.*
2 Gallons of Rum, at 9|6.
1 Gallon of Holland Gin, 9|6.
1 Gallon of common Gin, 5|6.
2 Dozen of red Port, at 22*s.* per dozen.
Caſh taken to Day for Sundries, 5*l.* 3*s.*

Poſted.

N. B. Theſe Articles are all ſeperately poſted or entered into the Ledger, except the laſt Article, viz. Caſh taken to Day for Sundries; which is omitted, as it is only by Way of Memorandum or Curioſity to know what is daily taken, ſo that any Perſon may make a private Caſh Book to his own liking of all he pays or receives.

OF THE

LEDGER.

1. THE Ledger is the Day Book taken to Piec and digeſted in a proper Manner, having every Man's particular Accompt of his Debt entered or poſted on the left Hand Side thereof, Word for Word, with the ſaid Day Book, with only this Addition, that the Money, or whole Debt, is here inſerted in three Columns containing Pounds, Shillings and Pence.

2. In large Accompts of Merchandize indeed, the Ledger has 4 Columns; the firſt of which is the Page of the *Journal* or Day Book properly digeſted; but as here is no Journal or Caſh Book, only a plain ſimple Diary, there is no Occaſion for Pages of References, the Day of the Month being very ſufficient for that Purpoſe.

3. As there is therefore no Occaſion for a Journal, in ſuch ſimple Accompts as theſe; ſo there cannot be an immediate Neceſſity for a regular Caſh Book, or a ſeperate Accompt of Caſh and Stock being Debtor or Creditor to each other, as it muſt of Neceſſity be in all extenſive Trades or mercantile Buſineſs.

3. Therefore as here is no regular Caſh Book, you muſt take Care that when any Perſon pays you Money that deals with you in an open Accompt in the Ledger, be very careful to turn to the Ledger and enter it forthwith on the Creditor's, or right hand Side, and then no Miſtake can be made. The ſame muſt be done when you receive any Goods on Accompt: Several Examples of theſe, you may ſee in the Ledger, Pages 3, 8, 11, and 13th, *&c.*

4. If an Accompt is diſcharged at one Payment, enter it as it Pages 4 *(Nicholas Forſter)* Page 5th, *Paul Hewitſon*, each in full it ſays, *&c.*

5. When it happens that a Perſon reckons with you, and does not pay the Balance of the Accompt that you then ſettled: never let the old Accompt ſtand uncloſed, but ballance it properly (whether it be ſettled without his giving you a Note, or whether he gives you a Note, which no doubt is beſt) by taking the Balance due from him to you on the Creditor's Side, and remove it by opening a freſh Accompt on the Debtor's ſide. Thus you ſee, Folio 1, in the Accompt of *Thomas Barker*, that *April* the 2d, he left 3 Guineas due in the Ballance, and gave a Note of Hand to pay it in a Month, the Note accordingly is entered on the Creditor's Side in order to balance the Accompt; but then it is at the ſame Time brought to the Debtor's Side to ſhew he is ſtill Debtor till paid. Then *May* the 10th, you ſee the ſaid Note is paid and a full Balance ſtruck between Parties, the Note being given up.

Thus it appears that all Affairs of common Buſineſs (not large mercantile Accompts) may be kept regular by Care and ſingle Entry only.

6. As for a Caſh Book, any Perſon may keep an Accompt of what he pays and receives without any Difficulty, if there be but an honeſt Deſign and good Reſolution.

7. The *Alphabet* is a Liſt of the Names of all ſuch Perſons that you have an open or conſtant Accompt with, and it is formed or made alphabetically, by putting the Surname of the Perſons firſt under the Letter of the Alphabet it begins with, and then the Chriſtian, or nominal Name, after it, and in the Column, oppoſite to the Name, is the Folio of the Ledger the Accompt ſtands in, as follows.

OF

1765.	*John Andrews*, Dr.	£.	S.	d.
Jan. 1.	To 14 lb. of Soap at 5 *d.* ——	—	5	10
	To 2 lb. of green Tea, at 14 *s.* per lb.	1	8	—
	To 2 lb. of Bohea, at 6/6 ——	—	13	—
18	To 12 Yds. of Fuſtian, at 3 *s.* ——	1	16	—
	To 5 Yds. of Shalloon, at 19 *d.* ——	—	7	11
	To 3 ½ Yds. of blue Broad Cloth, at 18 *s.*	3	3	—
	To 7 Yds. of Check, at 14 *d.* ——	—	8	2
		8	1	11

1765.	*Thomas Barker*, Dr.			
Jan. 1.	To 1 piece of Iriſh 25 Yds. at 2/3 —	2	16	3
	To 12 Yds. of Check, at 1 *s.* ——	—	12	—
18	To 3 dozen of Candles, at 6/4 ——	—	19	—
	To 40 Yds. of Check for Bed Curtains, at 20 *d.* —— —— ——	3	6	8
	To 14 lb. of Soap at 7 *d.* ——	—	8	2
		8	2	1
April 7.	To a Note of Hand, due May 7, as per Contract. —— ——	3	3	—

N. B. Here you ſee the 3 Guineas Balance on the Creditor's Side is brought to a freſh Account, and made Debtor on this Side.

1765.	*Contra* Cr.	*l.*	*s.*	*d.*
Jan. 17	By Caſh by *Hobb* the Carrier ——	1	1	—
March 7	By 1 Chaldron of Coals ——	1	7	—
April 14	By a Load of Wood —— ——	—	14	—
25	By Caſh to Balance, received ——	4	19	11
		8	1	11

1765.	*Contra* Cr.	*l.*	*s.*	*d.*
Feb. 14	By Caſh of his Servant ——	2	2	—
19	By Hay and Straw —— ——	—	15	1
March 3	By Caſh —— ——	2	2	—
April 7	By a Note of Hand received for 1 Month carried to Debtor's Side. ——	3	3	
		8	2	1
May 10	By Caſh in full of the ſaid Note ——	3	3	—

1765.	*William Batſon*, Dr.	l.	s.	d.
Jan. 1	To 12 lb. of Currants, at 5 *d.* ½	—	5	6
	To 14 lb. of Raiſins, at 5 *d.*	—	5	10
	To 4 Hats, 7|6 each	1	10	—
	To 28 lb. of Sugar, at 4 *d.*	—	9	4
	To 1 Loaf of ditto 9 lb. at 8 *d.*	—	6	—
19	To 1 Cwt. of Liſbon Sugar	2	10	—
	To 28 lb. of Raiſins, at 5 *d.*	—	11	8
	To 8 lb. of Rice, at 5 *d.*	—	3	4
	To 14 Yds. of Ruſſia, at 15 *d.*	—	17	6
		6	19	2

1765.	*Ann Charlton*, Dr.			
Jan. 1	To 2 Pieces of black Ribbon 12 Yds. each, at 5 *d.* per Yd.	—	10	—
	To 2 ditto white 10 Yds. each, at 6 *d.*	—	10	—
	To 4 Ditto flowered, 9 Yds. each, 36 Yds. at 7 *d.*	1	1	—
21	To 3 Pieces of blue Ribbon 25 Yds. at 5 *d.*	—	10	5
	To 1 ditto 15 Yds. white flowered, at 5 *d.* ½.	—	6	10½
	To 4 ½ Yds. of Lace, at 4|6	—	18	—
	To 19 Yds. of ditto, at 2|6	2	7	6
	To 2 Pieces of Pink Ribbon, 20 Yds. 5 *d.*	—	8	4
		6	12	1½

1765.	*Contra* Cr.	*l*	*s.*	*d.*
Feb. 21	By Caſh received of him ——	2	12	6
March 7	By a Side of Pork 63 lb. at 5 *d.* —	1	6	3
27	By Balance received — ——	3	—	5
		6	19	2

1765.	*Contra* Cr.	*l*	*s.*	*d.*
Feb. 18	By Caſh of your Servant ——	1	1	—
March 14	By Caſh in full —— ——	5	11	1½
		6	12	1½

1765.	*Richard Davis*, Dr.	*l.*	*s.*	*d.*
Jan. 2	To 12 lb. of Indico, at 18 *d.* —	—	18	—
	To 2 lumps of Sugar, weight 50 lb. at 6 *d.* —— ——	1	5	—
	To 4 fingle refined Loaves, 30 lb. at 8 *d*	1	—	—
	To 2 double refined 17 lb. ½, at 10 *d.*	—	14	7
22	To 14 lb. of Sugar, at 5 *d.* ——	—	5	10
	To 2 Loaves ditto, weight 17 lb. at 8 *d.*	—	11	4
	To 1 Lump 25 lb. at 7 *d.* ——	—	14	7
	To 6 lb. of green Tea, at 12 *s.* ——	3	12	—
	To 12 lb. of Bohea, at 7 *s.* ——	4	4	—
		13	5	4

1765.	*Jonathan Edwards*, Dr.			
Jan. 2	To 6 Dozen of Brafs Buttons, 6 Dozen of Scarlet, at 9 *d.* per Dozen ——	—	9	—
	To 3 Dozen of Ditto, for Waiſtcoats, at 8 *d.* —— ——	—	2	—
	To ⅛ of blue Velvet, at 16 *s.* per Yd.	—	2	9
23	To 7 Yds. of Fuſtian, at 2|3 ——	—	15	—
	To 9 Yds. of fine blue 7 qr. Cloth, at 18 *s.* —— ——	8	2	—
	To 12 Yds. of Frize, at 4|3 ——	2	11	—
	To 8 Yds. of Serge, at 4 *s.* ——	1	12	—
	To 3 Dozen of Brafs Buttons, at 20 *d.*	—	5	—
	To 3 ditto plain blue, at 9 *d.* ——	—	2	3
	To ½ Oz. of blue Silk ——	—	1	4
	To ½ Oz. of various Colours Ditto —	—	1	3
		14	3	7

1765.	*Contra*, Cr.	£.	s.	d.
Jan. 12	By Cash received of Mrs. *Davis* —	2	2	—
17	By 1 Load of Hay — —	2	5	—
April 4	By Cash	1	11	6
17	By Cash to Balance	—	6	8
		13	5	2

1765.	*Contra*, Cr.	£.	s.	d.
Feb. 5	By a Bill received making me a Suit of Cloaths, Silk, Twist, &c.	2	17	—
19	By Cash received	5	5	—
21	By a pair of new Stays my Wife	1	16	—
	By ditto my Daughter	1	10	—
March 9	By a whole Suit of Fustian for Son, and making as per Bill	2	4	6
21	By Cash in full	—	11	1
		14	3	7

1765.	*Nicholas Forſter*, Dr.	*l.*	*s.*	*d.*
Jan. 3	To Three Gallons of fine lamp Oil, at 3 *s.* per Gallon — — —	—	9	—
	To 2 Gallons of train Oil, at 2 *s.* —	—	4	—
	To half Gallon of ſweet Oil, at 10 *s.* 6 *d.*	—	5	3
23	To 2 lb. of 10 *s.* green Tea	1	—	—
	To 1 lb. of 8 *s.* ditto	—	8	—
		2	6	3

1765.	*Abraham Gibſon, Eſq.* Dr.			
Jan. 3	To 2 Quarts of Ketchup, at 2|6	—	5	—
	To 100 of pickled Cucumbers	—	1	3
23	To 1 lb. of Chocolate	—	5	6
	To 1 lb. of Coffee	—	4	6
	To 2 Gallons of Brandy, at 10 *s.*	1	—	—
	To 2 ditto Rum, 11 *s.*	1	2	—
	To 14 Yds. of Holland, at 4|6	3	3	—
		6	1	3

1765.	*Contra*, Cr.	£.	s.	d.
March 9	By Caſh received in full — — —	2	6	3

1765.	*Contra*, Cr.	£.	s.	d.
March 3	By a Note on *Martin Drake*, received of him — — — —	5	—	—
29	By Caſh in full — — — —	1	1	3
		6	1	3

1765.	*Nicholas Forſter*, Dr.	*l.*	*s.*	*d.*
Jan. 3	To Three Gallons of fine lamp Oil, at 3 *s.* per Gallon — — —	—	9	—
	To 2 Gallons of train Oil, at 2*s.* —	—	4	—
	To half Gallon of ſweet Oil, at 10*s.* 6*d.*	—	5	3
23	To 2 lb. of 10*s.* green Tea	1	—	—
	To 1 lb. of 8*s.* ditto	—	8	—
		2	6	3

1765.	*Abraham Gibſon, Eſq.* Dr.			
Jan. 3	To 2 Quarts of Ketchup, at 2|6	—	5	—
	To 100 of pickled Cucumbers	—	1	3
23	To 1 lb. of Chocolate	—	5	6
	To 1 lb. of Coffee	—	4	6
	To 2 Gallons of Brandy, at 10*s.*	1	—	—
	To 2 ditto Rum, 11*s.*	1	2	—
	To 14 Yds. of Holland, at 4|6	3	3	—
		6	1	3

1765.	*Contra*, Cr.	£.	s.	d.
March 9	By Caſh received in full — — —	2	6	3

1765.	*Contra*, Cr.	£.	s.	d.
March 3	By a Note on *Martin Drake*, received of him — — — —	5	—	—
29	By Caſh in full — — — —	1	1	3
		6	1	3

1765.	*Paul Hewitſon*, Dr.	*l.*	*s.*	*d.*
Jan. 4	To 3 Oz. of Nutmegs, at 8*d.* —	—	2	—
	To 5 lb. of Indico, at 20*d.* — —	—	8	4
	To Ginger 4*d.* Pepper 6*d.* — —	—	—	10
24	To 6 Dozen of Candles, at 6|8	2	—	—
	To 14 lb. of Soap, at 6*d.* — — —	—	7	—
	To 9 Yds. of Iriſh, at 2|3 — —	1	—	3
		3	18	5

1765.	*Edward Jackſon*. Dr.			
Jan. 4	To 14 lb. of Soap, at 6*d.* ½. ——	—	7	7
	To 3 ½ Yds. of ſuperfine blue Cloth, at 18*s.* — — — — —	3	3	—
24	To 2 Gallons of Brandy, at 7|6	—	15	—
	To 2 ditto Rum — — — —	—	9	6
		4	15	1

1765.	*Contra*, Cr.	*l.*	*s.*	*d.*
April 5	By Caſh in full —— ——	3	18	5

1765	*Contra*, Cr.			
Feb 20	By Caſh on Accompt —— ——	3	8	—
May 3	By 4 Buſhels of Malt, at 4|6 ——	—	13	—
14	By Caſh in full ——	—	14	1
		4	15	1

1765	*Philip Knapton*, Dr.	*l.*	*s.*	*d.*
Jan. 5	To 3 Pieces of Check, *viz.*			
	17 Yds. at 10*d.*	—	14	2
	22 Yds. at 11*d.*	1	—	2
	24 Yds. at 13*d.*	1	6	
	To 16 Ells of Holland, at 4|9	3	16	
	To 4 Yds of Muſlin, at 3|4	—	17	4
	To 6 Yds. of ~~Cambrick~~, at 7|6	2	5	
24	To 4½ Yds. of ſuperfine blue cloth, at 19*s.*	4	5	6
	To 5 Yds. of white Shalloon, at 22*d.*		9	2
		14	13	4

1765	*Charles Longman*, Dr.			
Jan. 6	To 3 qrs. of cwt. of Raiſins, at 1*l.* 18*s.* per. cwt.	1	8	6
	To ½ cwt. of Soap, at 2*l.* 5*s.*	1	2	6
	To 2 Quarts of Oil, at 3*s.* per Gallon	—	1	6
	To 1 Pint of ſweet Oil	—	1	3
	To 14 lb. of Rice, at 4*d.*	—	4	6
25	To 1 Piece of Dowlas 27 Yds. at 14*d.*	1	11	6
	To 7 Ells of Holland, at 5*s.*	1	15	—
		6	4	9

1765.	*Contra*, Cr.	*l.*	*s.*	*d.*
Feb. 13	By Cash himself — — — — —	3	3	—
March 11	By ditto his Servant — — — —	5	5	—
April 9	By Cash in full — — — — —	6	5	4
		14	13	4

1765.	*Contra*, Cr.			
Feb. 15	By Cash received — —	1	1	—
March 14	By Ditto — — —	1	1	—
29	By ditto in full — — — — —	4	2	9
		6	4	9

1765.	*Isaac Mackie, Esq.* Dr.	l.	s.	a.
Jan. 6	To 1 lb. of Tobacco — — —	—	1	6
	To 2 Bottles of Ketchup, at 2|6 ——	—	5	—
	To 2 lb. of Currants, at 5 *d.* ——	—	—	10
	To Nutmegs 2 Quarts of Vinegar, 9*d.*	—	1	—
	To 7 lb. of Soap, at 5*d* ½ ——	—	3	2½
	To 2 Dozen of Eggs, at 4*d.* —— —	—	—	8
25	To 2 lb. of 6*s.* Bohea Tea —— —	—	12	—
	To 1 lb. of Coffee —— ——	—	4	6
	To half Dozen Pocket Handkerchiefs, at 19 *d.* —— —— —	—	9	6
	To 2 ditto red and white, at 2|3 ——	—	4	6
		2	2	9

1765.	*Rev. Jacob Nelson*, Dr.	l.	s.	a.
Jan. 7	To 2 lb. of Coffee, at 4|6 ——	—	9	—
	To 2 Wash Balls —— —— ——	—	—	10
	To 1 lb. of best Tobacco —— ——	—	1	10
	To 6 lb. of Raisins, at 5 *d.* — —	—	2	6
	To 4 lb. of Currants, at 5*d.* ——	—	1	10
	To 1 lb. of Bohea —— —— —	—	6	6
	To 1 lb. of Green Tea — —— —	—	14	6
	To 7 lb. of Salt —— — ——	—	—	10½
	To 2 oz. of Mace, at 9 *d.* — —	—	1	6
	To 3 lb. of Rice —— — —	—	—	9
		2	—	1½

1765.	*Contra*, Cr.	*l.*	*s.*	*d.*
April 5	By Cash received —— ——	2	2	9
		2	2	9

1765.	*Contra*, Cr.			
	By Tithes due Christmas last ——	1	—	—
March 27	By Cash received of him in full ——	1	—	1½
		2	—	1½

1765.	*David Phipps*, Dr.	*l.*	*s.*	*d.*
Jan. 7	To 14 lb. of Jar Raiſins, at 7*d.* ——	—	8	2
	To 2 lb. of Almonds, at 14*d.* — —	—	2	4
	To 1 Cheſt of Tea, 1 Cwt. 3 qrs. at 30 *l.* per Cwt. —— ——	45	—	—
26	To a Bill Caſh paid by his Order (dated 15th Inſtant) to John Stowe, Wine Merchant —— — — ——	5	8	3
	To 10 Yds. of flowered Cotton his Daughter, at 3|6 per Yd. — —	1	15	—
	To 6 Yds. of Check, at 13 *d.* — —	—	6	6
		53	—	3

1765.	*Andrew Phillips*, Dr.			
Jan. 8	To 2 Baſkets of Malagas, 104 lb. at 4*d.*	1	14	8
	To a Baſket of Figs 36 lb. at 7*d.* ——	1	1	—
	To 4 lb. Cocoa, at 2*s.* — —— —	—	8	—
	To 40 lb. of Liſbon Sugar, at 6*d.* —	1	—	—
	To 2 Thouſand of 10*d.* Nails, at 5|3	—	10	6
26	To 14 Yds. of Pluſh, at 5|6 — —	3	17	—
	To 2 Dozen of Coat Buttons, at 14*d.*	—	2	4
	To a green Velvet Cap ——	—	7	6
		9	1	—

1765.	*Contra*, Cr.	*l.*	*s.*	*d.*
Feb. 7	By Caſh received of himſelf ——	21	—	—
March 11	By a Bank Note, K No. 241 ——	20	—	—
April 25	By 6 Yds of Lace, 5|6 —— ——	1	13	—
	By 3 Yds. of ditto, at 10|6 —— —	1	11	6
May 7	By Caſh in full —— — —	8	15	9
		53	—	3

1765.	*Contra*, Cr.	*l.*	*s.*	*d.*
Feb. 23	By Caſh received — —— —	2	12	6
March 5	By 8 Buſhels of Malt, at 4*s.* — —	1	12	—
April 7	By Ditto in full — — — — —	4	16	6
		9	1	—

1765.	*Robert Raymona*, Dr.	*l.*	*s.*	*d.*
Jan. 8	To 2 Gallons of Brandy, at 8*s.*	—	16	—
	To 2 Gallons of Rum, at 9|6	—	19	—
	To 2 ditto Engliſh Gin, at 4|6	—	9	—
	To 2 ditto Hollands, at 9|6	—	19	—
	To 1 Gallon of Anniſeed, at 4|6	—	4	6
	To 1 Gallon of Cinnamon, at 10|6	—	10	6
28	To 4 Gallons of Brandy, at 8*s.*	1	12	—
	To 2 Gallons of Rum, at 9|6	—	19	—
	To 1 ditto Holland Gin	—	9	6
	To 1 Gallon of beſt Engliſh ditto	—	5	6
	To 2 Dozen of Red Port, at 22*s.*	2	4	—
		9	8	—

1765.	*Thomas Rogers*, Dr.			
Jan. 9	To 100 of red Herrings	—	3	6
	To 1 Jar of linſeed Oil 4 Gallons, at 4|6	—	18	—
	To 1 Baſket of Raiſins 50 lb. at 4*d.*	—	16	8
	To 60 pickled Herrings	—	5	6
	To ¼ Cwt. of Soap at 2*l.* 10*s.*	—	12	6
29	To 7 Ells of Holland, at 4|6	1	11	6
	To 2 Pieces of Cambrick, 8 Yds. each, at 9*s.*	7	4	—
	To Ditto Muſlin 5 Yds. each, at 4|6	2	5	—
	To 12 Yds. of Fuſtian, at 2|3	1	7	—
	To 4 Yds. of Baiz, at 16*d.*	—	5	4
		15	9	—

1765.	*Contra*, Cr.	*l.*	*s.*	*d.*
Feb. 27	By Caſh of himſelf received	2	2	—
March 4	By a Turkey	—	5	8
	By 8 lb. of Bacon, at 8*d.*	—	5	4
17	By Caſh in full	6	15	—
		9	8	—

1765.	*Contra*, Cr.			
March 19	By Caſh received	2	12	6
27	By a Bill on *John Davis* received	10	4	—
April 5	By Caſh to Balance received	2	12	6
		15	9	—

1765.	*William Smyth, Esq.* Dr.	l.	s.	d.
Jan. 9	To 1 Barrel of Anchovies	3	5	—
	To 2 Bottles of Ketchup, at 2|6	—	5	—
	To 14 lb. of Rice at 5*d.*	—	5	10
29	To 2 Bottles of Ketchup, at 2|9	—	5	6
	To 1 Gallon of Vinegar	—	2	8
	To 14 lb. of Soap at 6*d.*	—	7	—
		4	11	—

1765.	*Theophilus Smith,* Dr.			
Jan. 10	To 2 Pieces of Iriſh, each 25 Yds. at 18*d.*	3	15	—
	To 1 ditto of Dowlas, 28 Yds. at 10*d.*	1	3	4
	To 1 ditto Ruſſia, 22 Yds. at 16*d.*	1	9	4
	To 1 ditto Check, 19 Yds. at 11*d.*		17	5
	To 1 ditto fine ditto, 20 Yds. at 13*d.*	1	1	8
30	To 12 China Cups and Saucers	—	14	—
	To a China Tea Pot	—	5	6
	To 4 Dozen of white Stone Plates, at 3|6	—	14	—
		10	—	3

1765.	*Contra*, Cr.	*l*	*s.*	*d.*
Feb. 25	By Caſh received	2	1	—
March 4	By ditto	1	2	—
April 27	By ditto	1	8	—
		4	11	—

1765.	*Contra*, Cr.	*l*	*s.*	*d.*
Feb. 5	By Caſh	5	5	—
April 16	By a Side of Pork 7 lb. at 13*d.*	—	7	9
	By 2 Gallons of Port, at 12*s.*	1	4	—
May 4	By Caſh in full	2	13	6
		10	—	3

1765.	*Rev. Charles Smyth*, Dr.	*l.*	*s.*	*d.*
Jan. 12	To 2 lb. of Chocolate, at 5|6 ——	—	11	—
	To 2 lb. of Coffee, at 4*s.* —— —	—	8	—
	To 1 lb. of Hyſon Tea —— ——	—	14	6
	To 1 lb. of Bohea —— —— —	—	9	—
	To 1 Loaf of ſingle refined 12 lb. 8*d.*	—	8	—
	To 1 ditto doulbe refined 8 lb. at 11*d*	—	7	4
30	To 2 lb. of Coffee, at 4|3 —— —	—	8	6
	To 1 lb. of Bohea Tea —— ——	—	6	6
	To 1 lb. of Green ditto —— ——	—	12	6
		4	5	4

1765.	*Jeremiah Thompſon*, Dr.			
Jan. 14	To 12½ Yds. of Fuſtian, at 2|3 ——	1	8	1½
	To 2 Dozen of Coat Buttons, at 14*d.*	—	2	4
	To ditto Waiſtcoat, at 10*d.* ——	—	1	8
	To 4 Yds. of Freeze, at 4|6 ——	—	18	—
	To 8 Yds of Shalloon, at 19*d.* ——	—	12	6
30	To 4 dozen of red Port, at 22*s.* per Doz.	4	8	—
	To 6 Dozen of Mountain, at 25*s.* per Dozen — — —— ——	7	10	—
	To 2 Dozen of Madeira, at 30*s.* —	3	—	—
		18	—	1½

1765.	*Contra*, Cr.	*l.*	*s.*	*d.*
Feb. 5	By ſmall Tithes, 1 Year's Agreement to Chriſtmas ——	2	2	—
March 27	By Caſh received in full ——	2	3	4
		4	5	4

1765	*Contra*, Cr.			
March 16	By a Side of Hampſhire Bacon 114 lb. at 5*d* — —— —— —— ——	2	7	6
27	By 4 Groſs of Bottles, at 1 *l.* 10 *s.* per Groſs —— —— —— ——	6	—	—
April 9	By a large Looking Glaſs gilt ——	8	8	—
May 15	By Caſh in full —— —— —— ——	1	4	7½
		18	—	1½

1765.	*Moſes Walton*, Dr.	*l.*	*s.*	*d.*
Jan. 15	To 6 Dozen of Candles, at 6|4	1	18	—
	To 1 Piece of Holland 22 Yds. at 4|2	4	11	8
	To 1 ditto Iriſh, 24 Yds. at 2|3	2	14	—
	To 7 lb. of hard Soap, at 6*d*	—	3	6
	To 4 lb. of ſoft, at 5*d*.	—	1	8
	To 12 Yds of green Baiz, at 16*d*.	—	16	—
31	To 14 lb. of Smyrnas, at, 4½	—	5	3
	To 12 lb. of Currants, at 15*d*	—	5	—
	To 8 lb. of Tobacco, at 18*d*.	—	12	—
	To 6 lb. of ditto, at 1*s*	—	6	—
		11	13	1

1765.	*Sarah Watſon*, Dr.			
Jan. 16	To 4 Yds. of black Ribbon, at 5*d*.½	—	1	10
	To 2 Yds. of Green, 2 Yds. of Blue, at 6*d*. ½.	—	2	2
	To 12 Yds. of printed Cotton, at 4|6	2	14	—
	To ¼ lb. of Nutmegs	—	2	6
	To ¼ lb. of Pepper	—	—	6
	To 6 lb. of Raiſins, at 5*d*.	—	2	6
	To 5 Yds. of Check, at 14*d*.	—	5	10
31	To 3 Pieces of black Ribbon, viz. —			
	No. 1—12 Yds. } at 4*d* ½	—	4	6
	2—14	—	5	3
	3—15	—	5	7½
	To 1 Piece of white 10 Yds. at 6*d* ½	—	5	6
	To 1 ditto blue 12 Yds. at 6*d*.	—	6	—
	To 1 ditto Green 11 Yds. at 7*d*.	—	6	5½
	To1 ditto Pink 9 Yds. at 6*d*½	—	4	10
		5	7	6

1765.	*Contra*, Cr.	*l.*	*s.*	*d.*
March 5	By Cash received	2	2	—
17	By 4 Cwt. of Tallow, at 4 *l.* 17 *s.* 4 *d.* per Cwt.	7	9	4
April 14	By Cash in full	2	1	9
		11	13	1

1765.	*Contra*, Cr.			
April 5	By Cash	3	3	—
16	By a black Silk Bonnet	—	7	6
19	By a green Silk Hat	—	6	6
May 5	By Cash in full	1	10	6
		5	7	6

1765.	*Joseph Young, Esq.*	*l.*	*s.*	*d.*
Jan. 17	To 1 lb. of Tea, at 14*s.*	—	14	—
	To 2 lb. of Coffee, at 4|6	—	9	—
	To 8 lb. of Sugar, at 4*d.*	—	2	8
	To 12 lb. at 5*d.*	—	5	—
	To 12 lb. of Raiſins, at 6*d.*	—	6	—
	To 3 lb. of Almonds, at 10*d.*	—	2	6
	To 4 lb. of Pruins, at 4$d\frac{1}{2}$	—	1	6
	To 25 lb. of Malagas, at 4*d.*	—	8	4
	To 14 lb. of Currants, at 5*d.*	—	5	10
	To Mace, Cinnamon and Nutmegs	—	—	10
31	To 1 Piece of Holland 20 Yds. at 5|3	5	5	—
	To 4 lb. of Cocoa, at 4|4	—	17	4
	To 2 lb. of green Tea, at 14*s.*	1	8	—
	To 3 lb. of ditto, at 12*s.*	1	16	—
	To 4 lb. of Bohea, at 7|6	1	10	—
	To 2 Gallons of Shrub, at 11*s.*	1	2	—
	To 2 ditto of Rum, at 10*s.*	1	—	—
	To 2 ditto of Brandy, at 9*s.*	—	18	—
	To 3 dozen of Glaſſes, at 4|6.	—	13	6
	To a 2 Quart double Flint Decanter.	—	5	—
	To 1 of a Quart ditto	—	3	—
	To 2 large Flint Tumblers	—	2	6
	To 10 Yds. of Hair Cloth, at 14*d.*	—	11	8
	To 12 Yds. of Matting, at 15*d.*	—	17	—
		18	16	4

1765.	*Contra*, Cr.	*l.*	*s.*	*d.*
Feb. 14	By Caſh received by his Footman ——	5	5	—
19	By a Hhg. of Cyder ——	4	14	6
March 25	By Caſh received of the Carrier ——	2	2	—
April 14	By Ditto of his Footman ——	3	3	—
17	By a Load of cubic Wood	—	10	6
27	By a Load of Stack Wood ——	—	14	—
March 16	By Caſh received in full —— ——	2	7	4
		18	16	4

APPENDIX,

Containing

Some NECESSARY INSTRUCTIONS *in* MENSURATION.

AS this ſmall Treatiſe may fall into the Hands of many Perſons who would be glad to have ſome Inſight to Meaſures, Superficies and Solids, viz. Carpenters, Joiners, Glaziers, Painters, Plaiſterers, Paviors, Bricklayer's Work, *&c.* I thought it would be very acceptable to lay down Rules and give a few Examples for the Benefit of thoſe whoſe Buſineſs require it; and even to ſuch as have no Occaſion for theſe Things, yet the Practice of them will become uſeful and entertaining.

I. *Of Croſs Multiplication.*

This conſiſts of Feet, Inches and Parts, viz. 12 Parts make 1 Inch, 12 Inches 1 Foot.

Croſs Multiplication is performed 2 different Ways, the firſt by Multiplication, the 2d by Multiplication and Diviſion like the Rule of Practice. The firſt is the moſt common Way; but the 2d, (in my Opinion) is the beſt, being eaſier upon the whole and much ſhorter.

Rule for the Firſt Way.

1 Feet × or multiplied by Feet produce Feet.
2 Feet × Inches produce Inches.
3 Inches × Inches produce Inches.

All of which (except Feet × Feet) are to be divided by 12, if the Product be 12, or above 12; Thus,

Feet

Feet × Inches ÷ 12 produce Feet and Inches, and Inches × Inches ÷ 12 produce Inches and Parts.

EXAMPLE.

There is aFloor whoſe Length is 47 Feet, 8 Inches long, and 9 Feet, 4 Inches wide, I demand the Content?

	F.	*In.*
The Work	47.	8
by	9.	4
	423	
	6.	
	15.	8
		.2.8
	444.	10.8

Firſt 9 × 47 Feet = 423 Feet : 9 Feet × 8 Inches = 72 Inches = 6 Feet. Then 47 Feet × 4 Inches = 188 Inches = 15 Feet 8 Inches, and laſtly 8 Inches × 4 = 32 Inches = 2 Inches 8 Parts.

The Second Method.

Rule. Multiply the laſt or ſmalleſt Denomination of the Multiplicand, by the greateſt or firſt Denomination of the Multiplier, carrying 1 for every 12 (according to the firſt Direction of all) then take the even Parts of the next leſſer Part as in the Rule of Practice, and divide the top Numbers or Multiplicand by thoſe even Parts, and ſet down the whole Number, if any Thing remains reckon them as ſo-many Times 12, and take the Parts of them as before, and always remember that you do by 12 at every one of the Denominations.

The Work of the former Example.

	F.	In.
Multiply	47	8
by	9	4
	429	
$\frac{1}{3}$	15	10.18
	444	10.8

First multiply 47 Feet 8 Inches by 9 Feet, ſaying, 9 Times 8 is 72 Inches, which is juſt 6 Feet; then 9 Times 7 is 63, and 6 I carried is 69; 9 and carry 6, then 9 Times 4 is 36 and 6 is 42; thus 47.8 × 9 Feet = 429 Feet, then for the 4 Inches, I ſay, 4 Inches is $\frac{1}{3}$ of a Foot (as in Practice) and take $\frac{1}{3}$ of 47, I find it 15 Feet and 2 Feet over, to which I take in the 8 Inches, which is 2 Feet 8 Inches = 32 Inches, of which I take $\frac{1}{3}$ and find it 10 Inches and 2 over, which 2 Inches × 12 make 24 Parts, the $\frac{1}{3}$ of which is 8 Parts, and thus is the ſame Queſtion performed in 2 Lines, which by the firſt Rule took 4 Lines.**

Mr. *Wingate* and many others, tho' they often uſe the firſt Way, yet in any long and difficult Queſtions have Recourſe to this ſecond Method, ſee his Examples in Pages 384, 385 and 386.

2. Plaiſterers and Painters take their Dimenſions in Feet and Inches, but calculate by the Square Yard, viz. 9 ſquare Feet 1 ſquare Yard. There is a Room 94 Feet 6 Inches round, and 10 Feet 9 Inches high (to be painted) I demand how many ſquare Yards it contains?

Anſ. 1015 *Ft.* 10 *In.* 6 *Pts.* = 112 *Yds.* 7 *Ft.* 10 *In.* 6 *Pts.*

A Gentleman had a Court Yard paved with Scoth Pebbles; it was 216 Feet 4 Inches long, and 116 Feet 6 Inches wide, I demand how many ſquare Yards it contained? *Anſ.* 2608 *Yds.* 2 *Ft.*

Of Flooring, Tyling, Thatching, &c.

The Dimenſions are taken in Feet and Inches, but are caſt up by the Square, viz. 10 Feet Square = 100 Feet which is called 1 Square.

Rule.

Rule. Multiply the Length by the Breadth and divide by 100.

A Thatcher new thatch'd the Roof of a Barn, the Length was 65, and the Breadth from the Top of the Roof to the Eaves, 25 Feet; how many Squares does it contain?

Anſ. 16.25 Squares = 16 $\frac{1}{4}$.

4. *Of Brick Meaſure.*

This is performed by the Rod Square, viz. 16 $\frac{1}{2}$ × 16 $\frac{1}{2}$ Feet = 272 $\frac{1}{4}$ Feet which make 1 Square Rod of Brick-work at $\frac{1}{2}$ Brick thick, called Standard Meaſure.

Rule 1. Multiply the Length by the Breadth and divide by 272.25 (or by 272) gives the Content.

1. There is a Wall 97 Feet long, and 16 Feet high, and 1 $\frac{1}{2}$ Brick thick, I demand how many ſquare Rods it contains?

Anſ. 5 *Rods* $\frac{7}{10}$, *or* 5 *Rods* 190 *Feet and half, if you divide by* 272.25. But if you divide by 272 only (which is near enough) it will be 5 *Rod* 192 *Feet*, which makes but 1 $\frac{1}{2}$ *Foot* Difference.

Rule 2. When the Wall is more or leſs than 1 $\frac{1}{2}$ Brick thick, it is then ſaid not to be the Standard, and muſt be reduced to the Standard of 1 $\frac{1}{2}$ Brick. Thus

As 3 the half Bricks in the Standard to the Number of half Bricks in the given Wall, ſo is the Content at 1 $\frac{1}{2}$ thick to a Wall of any given Thickneſs.

Then ſuppoſe a Wall of the ſame Length and Heighth as before, and 2 $\frac{1}{2}$ Bricks thick; what is the Content?

The Content at 1 $\frac{1}{2}$ Brick thick was found to be 5 *Rods* 7 *Tenths*. Then ſay

As 3 = 5 :: 5.7 : 9.5. That is, the Content at 2 $\frac{1}{2}$ Bricks thick is 9 $\frac{1}{2}$ Rods.

Again, Suppoſe the ſame Wall only 1 Brick thick, ſay, As 3 : 5.7 :: 2 : 3.8. The Content therefore at 1 Brick thick, will be 3 Rods, 8 Tenths, and thus for any Thickneſs.

Rule 3. But there is yet another Method, and that is by having proper Diviſors at any Thickneſs; for having multiplied Length by Heighth as before; then

For Bricks thick.		*Divide by.*
Standard	1	408.39*
	1½	272.25
	2	204.2
	2½	163.35
Bricks thick	3	*Divide by* 136.12
	3½	116.68
	4	102.1
	4½	90.75
	5	81.75

N. B. If you caſt away the Decimal and divide by the whole Number only, it will do for common Uſe.

*Thus, if we take the former Example at 1 Brick thick only: I then ſay 97 × 16 = 1552; which divided by 408.39 or 408.4 (the Diviſor for 1 Brick thick) gives 3 Rods, 8 Tenths; and for 2½ Bricks thick, I divide by 163.35 and have 9 Rods, 5 Tenths, *viz.* 9½ Rods as before.

OBSERVATION.

From what has been ſaid it will evidently appear, that after having found the Content of any Piece of Brick Work according to the Standard at 1½ Brick thick, the Content may be very readily found at every other Thickneſs by the following Table, which alſo ſhews the Reaſon of the former Diviſors.

TABLE.

Bricks thick.

For	1 *ſubtract* ½	*This will reduce any Thickneſs to the Standard of* 1½ *Brick thick.*
	2 *add* ½	
	3 *multiply by* 2	
	4½ *mult. by* 3	
	6 *mult. by* 4	

Thus the Content of the foregoing Wall at 1 ½ Brick thick (or Standard) was found to be 5 Feet, 7 Tenths, now for 1 Brick thick ſubtract ⅓ which is 1.9 Tenths: Now 5.7 — 1.9 = 3.8 viz. 3 Feet, 8 Tenths, as before.

5. *Of digging Wells, Vaults or Cellars.*

The Dimenſions muſt be taken in Feet and Inches, in Length, Breadth and Depth; and the Anſwer is given in ſolid Yards, viz. 27 Feet, 1 ſolid Yard.

RULE

RULE. Multiply the Length, Breadth and Depth into each other, and divide the Product by 27, gives the Content.

There is a Cellar 9 Feet long, 7 Feet 6 Inches broad, and 4 Feet 6 Inches deep; I demand how many ſolid Yards of Earth were dug out of it?

Anſ. 11 $\frac{1}{4}$ *Yards.*— *For* 9 × 7.5 × 4.5 = 303.75 *which* ÷ 27 = 11.25 *or* 11 $\frac{1}{4}$.

6. *Of Board or ſuperficial Meaſure.*

RULE. If the Board is all of one equal Breadth, then multiply the Length in Feet by the Breadth in Inches, and divide by 12, you have the Content in Feet and the Remainder in Inches: Or multiply the Length in Inches by the Breadth in Inches, and divide by 144, the Inches in a ſquare Foot, gives the Content in Feet, and the Remainder in Inches, in Proportion as 144 is to 12.

Example 1. There is a Board 10 Feet, long and 14 Inches wide. I demand the Content?

Anſ. 11 $\frac{2}{3}$ *Feet.*

Or by the ſecond Way, 10 Feet or 120 In. × 14 = 1680 Inches, which ÷ 144 = 11 Ft. 96 Inches, *viz.* 11 $\frac{2}{3}$ as before.

Of Tapering Boards.

When a Board is much wider at one End than the other, it is cuſtomary with moſt Workmen to add the Dimenſions of both Ends together, and take the Half of that Sum for a mean Breadth throughout; but this is a very erroneous Method, for tho' it is of little Signification in a ſingle Board, or two or three, yet in a large Quantity it is of more Conſequence than Perſons in general are aware of, being a very great Hurt to the Buyer, and a great Advantage to the Seller, as will appear by the following Example, only wrought the cuſtomary and true Way that it may appear evident.

Example the Cuſtomary Way.

There is a Plank or Board 12 Feet long, and the Breadth at one End is 16 Inches, and at the other but 9 Inches I demand the Content?

First 16 + 9 = 25 Inches; the $\frac{1}{2}$ of which is 12 $\frac{1}{2}$ or 12 In. 6 Pts. for a Mean. Now 12 Ft. × 12 In. 6 Pts. = 150 Ft. the Content by the cuſtomary Way = 12 Ft. 72 ſquare Inches. Now this is $\frac{1}{2}$ a ſquare too much; therefore in 100 Boards it would be 50 ſquare Ft. too much, which is juſt 4 whole Boards or Planks that the Buyer pays too much for, as will evidently appear, if you only conſider the Method of finding a mean Proportional between two given Numbers as before, explained to you in the practical Examples in the Square Root as follows.

Rule for the True Method.

Take the Breadth of the Board or Plank at each End, and multiply them together; then extract the ſquare Root of that Sum and the Root will be a true mean Proportion, or the true mean Breadth (between the Extremes of the 2 Ends) throughout.

Thus I multiply 16 Inches 1 End by 9, and it gives juſt 144 Inches, the ſquare Root of which is 12 Inches or 1 Foot, for a mean, this multiplied by 12, the Length, gives 12 only.

7. *Of Timber or ſolid Meaſure.*

Of regular round Timber of one Girt only. The Method is, with a ſmall String or Cord, take the Circumference or Round of the Tree in any convenient Place agreed upon, then having well noted this Circumference in Inches divide it into 4 Parts or take the $\frac{1}{4}$th of it, and that Number is called the Girt.

RULE. Square the Girt, that is, multiply it by itſelf, and multiply it by itſelf, and multiply that Product by the Length of the Tree, which divide by 144 gives the Content?

Anſ. 6 Feet 108 In. which is 6 $\frac{3}{4}$ Feet.

There is a Tree 96 Inches in Circumference (or 24 Inches Girt) I demand the Content?

Anſ. 72 Feet.

Note. It is cuſtomary in large Trees or Pieces of Timber, to make an Allowance of 1 Inch for the Bark of a Tree; ſo that if the Girt be 24 as above, it is called 23.

Note.

Note. In ſome Places 40 Feet make a Load in others 50 Feet: Add the Content of all the Trees together, and divide by 40 or 50, gives Loads.

Of round tapering Timber.

In meaſuring long Trees it will be neceſſary to make a Mark with Chalk at any convenient Place, and ſuppoſe it then to be 2 Trees, then take the Girt of each, and meaſure them as 2 diſtinct Trees and add their Contents together, gives the Content of the Tree.

Or you may take the Girt at 3 or 4 different Places, add them all together, and divide their Sum by the Number of Girts, gives the mean Girt, which multiplied by the Length, and divided by 144, gives the Content.

8. *The Uſe of the common two Feet Slip Rule in meaſuring Board Timber, &c.*

Deſcription of the Rule.

The Rule and Slip are marked from 1, 2, 3 to 9; and then it begins from 9 to repeat 1, 2, 3 *&c.* again.

2. Now ſuppoſe I call the firſt Figure 1, 2, 3, one, two, three, *&c.* then when I come to the one (1) which ſtands in the middle of the Rule, it is evident that ſtands for 10, the two ſtands for 20, the 3 for 30, and if I call the firſt one (1) on the Rule ten (10) the two 20, *&c.* then the middle one will become a Hundred (100) 2 200, 3 300, *&c.* and the Halves and Quarters muſt be reckoned for 50 and 25. A little Practice will make it eaſy.

2. On this Rule you will find the 4 following Letters A, B, C and D, two of which, viz. A and D are on the Rule itſelf, and the other two B and C are on the little Side or Slip, and the reſpective Lines on the Rule or Slip, belonging to ſuch Letter or Letters, anſwer to the Rule of Proportion or Rule of three direct, as will evidently appear by the following Proceſs.

To multiply by the Rule.

Set 1 marked on the Slip B, againſt the Multiplicand on the Rule or Line A; then againſt the Multiplier upon the Line B ſtands the Product or Anſwer on the Line A.

EXAMPLE.

Multiply 9 by 5. Set 1 of B to 9 on A; then againſt 5 on B you will find 4 and 5 Strokes or Diviſions, which 4 is 40 and the Diviſions 5, viz. 45 multiply 16 by 15. *Anſ.* 240.

Multiply 45 by 36. *Anſ.* 1620.

Diviſion by the Rule.

This is only the Reverſe of the Former: For ſet the Diviſor found on the Line B, againſt 1 on the Line A, then againſt the Dividend on B will be the Quotient in A.

Divide 45 by 9? *Anſ.* 5.

Divide 240 by 16? *Anſ.* 15.

The Rule of Three by the Slip.

Set the 1ſt Number on B to your 2d Number on A, then againſt your 3d Number on B will be your Anſwer on A.

EXAMPLE.

If 1 lb. of Coffee coſt 4 Shillings, what coſt 9 lb.
Anſ. 36 Shillings.

If 1 lb. of Tea coſt 5*s.* 6*d.* what coſt 24 lb.
Anſ. 132 *s.* or 6*l.* 12*s.*

If 4 lb. of Tobacco coſt 7*s.* what coſt $\frac{1}{4}$ of Cwt.
Anſ. 49 Shillings.

Of ſuperficial Meaſure by the Rule.

N. B. The Lines A and B are uſed for Boards, or ſuperficial Meaſure, and C and D for Timber or ſolid Meaſure.

RULE.

Set the Length of the Board on the Line B, againſt the Number 12 on A; then againſt the Breadth on the Line B is the Anſwer on A.

EXAMPLE.

What is the Content of a Board 5 Feet long and 9 Inches wide?

Anſ. 45 Inches = 3 Feet, 9 Inches.

There

There is a Board 9 Feet long and 10 Inches wide; I demand the Content?

Anſ. 90 Inches = 7 Feet, 6 Inches.

Of Timber or ſolid Meaſure by the Rule.

This is performed very readily according to Cuſtom on the Lines C and D as follows.

Set the Length of the Tree found on the Lines C right againſt 12 on the Lines D (wrote upon the edge Girt Line) then againſt the Girt itſelf on C, you have the Content in Feet and Inches on the Line D.

Suppoſe a Tree 36 Inches round (viz. 9 Inches Girt) and 8 Feet long, what is the Content?

Anſ. 4 ½ ſolid Feet. For

Set 8 on C to 12 the Girt Center on D; then againſt 9 the Girt itſelf on C, you have 4 ½ Feet on D, the Content required.

Note. The Rule now ſtanding, as it is you may ſuppoſe 8 Feet long to be 80, then the Content will be 10 Times more, *viz.* 45 Feet.

There is a Tree 20 Feet long, and 10 ¾ Inch Girt; what is the Content?

Anſ. 16 Feet, 7 Inches.

Thus my dear TYRO, I have endeavoured to give you a juſt Idea, or Conception of things in general; if you want more tell me freely.

Scholar. Sir, you are extreamly obliging, and I accept your kind Offer, by deſiring ſome ſhort Informations in Gauging.

Maſter. You have your Requeſt; but the Inſtructions and Examples muſt be very ſhort; yet your Care and Practice may make good their Deficiency.

9. *Of Gauging.*

Gauging is that Art which teaches us to tell the Area and Content of any Veſſel, be it Cooler, Tub or Caſk in Ale or Wine Gallons; as alſo to tell the Content of any Ciſtern or Couch of Malt in Corn Buſhels.

N. B. Area ſignifies the Content or what it holds at 1 Inch deep only; and the Content, is found by multiplying the Area by the Depth.

1. *To gauge a Square or any Parallelogram or Long Square.*

Multiply the Length taken within-Side by theBreadth in Inches, and divide by 282 for Ale Gallons, by 231 for Wine, and by 2150 for Malt or Corn Buſhels.

EXAMPLE.

There is a Parallelogram or Cooler, whoſe Length is 40 Inches, its Breadth 22.3 Tenths, Depth 9 Inches; I demand the Area andContent in Beer and Wine Gallons, and Wine Gallons and Corn Buſhels?

Anſ. Area for Ale is 3.16 Gallons, for Wine 3.86, and for Malt Buſhels .4149.—Theſe ſeperately multiplied by Depth 9 Inches will give the true Content for Ale Gallons 28.44, for Wine 34.74 and in Buſhels 3.726.

By the Slip Rule for Ale Gallons.

Set 282 upon B, againſt 22.3 on A; then againſt 40 the Length on B is 3.86 on A as before.

For Wine Gallons.

Set 231 (the Inches in a Wine Gallon) upon B, to 22.3 on A; then againſt 40 on B, is 34.74 on A as before.

For Malt Buſhels.

Set 2150 (the Inches in a Buſhel) upon B, to 22.3 upon A; then againſt 40 on B, you will find .4149 a Decimal for the Area.

To find the Area of a Circle.

Square the Diameter, and divide that Product by 359 for Ale Gallons; by 294 for Wine, and by 2737.47 for Buſhels.

EXAMPLE.

Let there be a Cylindrical Tub (viz. one whoſe top and bottom Diameters are alike, ſuppoſe 3 Feet, 4 Inches, = 40 Inches, and the Depth 20 Inches, I demand the Area and Content in Beer and Wine Gallons and Corn Buſhels?

OPE-

OPERATION.

Diameter 40 × 40 = 1600 (to which add Cyphers for the decimal Parts) which divide by 359, gives 4.456 Gallons Area for Ale: The ſame divided by 294 gives 5.4489 Gallons for Wine; and dividing the ſame by 2737.47 gives .584 for the Malt Buſhels: Theſe ſeverally multiplied by the Depth 20, gives 89.12 Gallons of Ale, 108.978 Gallons of Wine and 11.68 Buſhels.

Area by the ſlip Rule for Ale.

Set 359 upon B to 40 the Diameter on A, then againſt 40 on B is 4.4 Parts on A, or near a Half. **

N. B. I have put only 4. and 4 Parts, becauſe on the Rule, the Learner cannot judge of, or perceive any more Decimal Parts than one in general.

For Wine.

Set 294 upon B, to 40 upon A; then againſt 40 on B, is 5.4 Gallons on A.

For Buſhels.

Set 2737.47 (or 2737) on B to 40 on A; then againſt 40 on B, you'll find .58 or near .6 on A.

To Gauge Caſks in General.

Firſt take the Diameter or Depth of the Caſk at the Bung-Hole from Inſide to Inſide, as alſo the Diameter at the Head: Then ſquare them both, and to twice the Square of the Bung Diameter, add the Square of the Head Diameter, then multiply this Sum by the Length of the Caſk in Inches, and divide the Product by 1077 (which is 359 × 3) gives the Content in Ale Gallons. Divide by 882 (viz. 3 times 294) gives the Wine Gallons.

EXAMPLE.

There is a Caſk whoſe Bung-Diameter is 34 Inches, Head 24 and Length 48; I demand the Content?

Anſ. 128.7 = 128 Gall. 5 Pints Ale and 147.17 = 157 Gall. 1 Pint, Wine.

The ſame by the Sliding Rule.

You remember I told you that the proper Diviſors for to find the Area of Circles in Ale or Wine Gallons are 359 and 294: Now the Square Root of theſe Numbers is 18.94 and 17.14 which are called Gauge Points on the Rule on the Line D: therefore

For

For Ale.

Set 18.94 (or 19) on the Line D to the Length on C; then againſt the mean Diameter (viz. 28.56) on D, you will find 128.7 Gallons as above.

For Wine.

Set 17.14 on D to the Length on C; then againſt the mean Diameter 28.5 on D, is 157 on C, the Wine Gallons required.

N. B. The Diviſor for Malt Buſhels for Squares is 2150; and the Gauge Point 46.36; for Circles 2737.47 whoſe Square Root is 52.32 a Gauge Point.

Thus have I, TYRO, given you ſmall Examples of many Things that are uſeful, which if you truly attend to you will ſoon be Maſter of. Farewel.

F I N I S.

E R R A T A.

The Reader is deſired to correct the following Errors of the Preſs.

Page 16, Line 7, for *Anſ.* 3 Grains *read* 18 Grains. P. 32, Example, for *Anſ.* 146, *read* 46. Ditto, bottom Line, for 1*s.* 10*d.* $\frac{1}{2}$. *read* 1*l.* 1*s.* 10*d.* $\frac{1}{2}$. P. 33, L. 32, *Banker's Hand* for 5000*l.* *read* 4605*l.* P. 37, L. 6, from the Bottom; for *Anſ.* 3596291, *read* 3596491. P. 43, Ex. 12, for *Anſ.* 9*l.* 19*s.* 6*d.* *read* 10*l.* 1*s.* 3*d.* Ditto, L. 35 for 9*l.* 19*s.* 6*d.* *read* 10*l.* 1*s.* 3*d.* L. 37, for 9*l.* 19*s.* 6*d.* *read* 10*l.* 1*s.* 3*d.* and for 10*l.* 4*s.* 3*d.* $\frac{1}{2}$. *read* 10*l.* 6*s.*—$\frac{1}{2}$. P. 60. Ex 17, for 140*l.* 2*s.* *read* 140*l.* 2*s.* 6*d.* P. 64. Table 1ſt, for 320 Furlongs, *read* 320 Rods. Table 2, for 40 X 40, *read* 40 X 4 = 1 Acre. Page 68, Example 3, for *Anſ.* 11*l.* 19*s.* 3*d.* *read* 14*l.* 5*s.* 9*d.* P. 76. Ex. 3, for *Anſ.* 300*l.* *read* 350*l.* P. 83, Ex. laſt, for 2571, *read* 2573. P. 88, E. 17, *read Anſ.* 51*l.* 3*s.* 8*d.* $\frac{1}{2}$. P. 91, Caſe 5, Ex. laſt, *read Anſ.* $\frac{120}{480}$ $\frac{420}{480}$. P. 94, Ex. 2d, for 13 Gallons 2 Pints, *read* 5 Gallons 2 Pints. P. 96, L. 8 and 11, for *Anſ.* 169, *read* 69 $\frac{11}{14}$. P. 102. L. 21, for *Anſ.* .456 *read* .36. P. 107, L. 16, for 3.98958, *read* 3.998958. P. 118. Ex. 1ſt. after Time *read* at 5*l.* per Cent. P. 154, Ex. 3, read *Anſ.* 239.84. P. 155, Rule 2, *read* from the Square of the Hypothenuſe.

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